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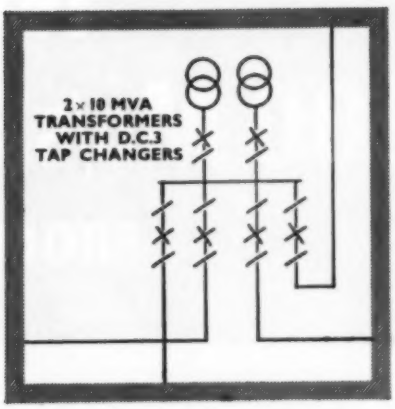

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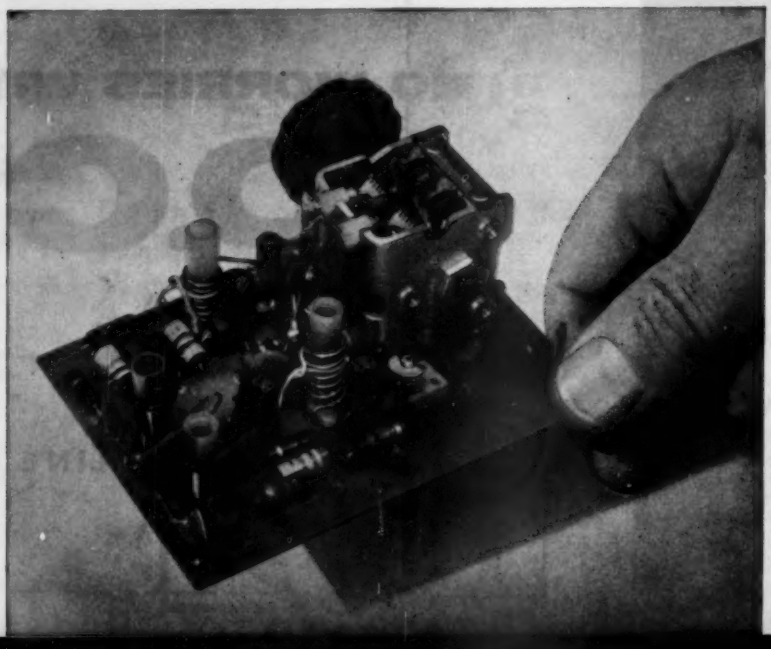

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ELECTRICAL ENGINEERING ABSTRACTS

Volume 63 **MARCH 1960** **Number 747**

GENERAL

(For abstracts on circuit theory see also Lines . Networks . Filters)

614.8

1123 ACCIDENTS AND THEIR PREVENTION. FACTORY INSPECTORATE'S ELECTRICAL REPORT FOR 1958.
Elect. Times, Vol. 137, 9-10 (Jan. 7, 1960).

A brief summary of the official report. Personal accidents increased somewhat over the previous year, fatalities being mainly associated with portable hand tools, overhead cranes and contact with o.h. lines. The importance of early artificial respiration is shown by quoted results. Disruptive accidents due to turbo-alternator and switchgear failures, including isolators, are recorded, with recommended procedure for application following operation on short-circuit. Earth-fault loop impedance testing is discussed at some length, with a recommendation for neutral-loop test instead of phase-loop test. E.H.W.Banner

614.8

1124 AUTOMATIC FIRE PROTECTION.
L.R.Leworthy.
Elect. J., Vol. 163, No. 25, 1360-5 (Dec. 18, 1959).

A survey of requirements and types of equipment. Stages in detection deal with gas and vapour leaks before a fire starts, to visible flame and high temperatures. Equipment outlined includes: (a) vapour detectors; (b) ionization tube methods; (c) gas detector with open and sealed air cells with heated filaments (katharometer); (d) smoke and flame detectors with photocells; (e) temperature detectors of five types, mainly bimetal devices, but also some air and liquid expansion forms and fusible links; and finally (f) ultrasonic methods of detecting rising hot-air currents. British Standards and a Code of Practice are quoted. E.H.W.Banner

o14.825 : 621.315.2

1125 GNAWING BEHAVIOUR OF THE RAT, WITH REFERENCE TO ATTACK ON PLASTIC CABLE.
A.W.Meadows and I.D.John.
Elect. Engrs (Melbourne), Vol. 36, No. 9, 43-5 (Dec. 10, 1959).

Laboratory tests in Australia were inconclusive, showing that rats show no real preference as between p.v.c., neoprene and butyl-covered cables and did not eat them as preferred food nor gnaw in order to grind their teeth. However, evidence is given that plastic-covered cables are gnawed by rats extensively in Australia, causing danger by fire through exposed bare wiring. E.H.W.Banner

621.3 : 537

1126 THE SELECTION AND DESIGN OF EXPERIMENTS FOR ALTERNATING CURRENT TEACHING. H.V.Beck.
Contemporary Physics, Vol. 1, No. 1, 49-55 (Oct., 1959).

The need for careful selection and design of experiments is stressed. The aims and other aspects of practical class teaching are examined and a method of appraising the educational content of a class as a whole is described with particular reference to alternating current experiments. Some general results of such an appraisal are given.

621.3

1127 ENGINEERING PROGRESS — 1959.
Elect. Engng, Vol. 79, No. 1, 30-49 (Jan., 1960).

621.3

1128 ELECTRICAL SAFETY REGULATIONS IN THE UNITED STATES, CANADA, AND EUROPE.
L.D.Price and H.P.Michener.
Elect. Engng, Vol. 79, No. 1, 69-74 (Jan., 1960).

A survey of the procedures of the European organization of the International Commission on Rules for the Approval of Electrical Equipment (C.E.E.) and the activities of several European countries in the field of safety regulations. First-hand observations over the past 3 years and a summary of safety regulations activities in Canada and the United States are presented.

621.3.011

1129 THE COULOMB FORCES BETWEEN SPHERICAL ELECTRODES. H.U.Stobernack.
Wiss. Z. Tech. Hochsch. Dresden, Vol. 8, No. 4, 893-6 (1958-59). In German.

Briefly summarises Konorski's theoretical work (Abstr. 3250 of 1957) showing that Coulomb attraction instead of repulsion can occur in certain conditions with two finite spheres of like potential, and describes experimental verification of Konorski's results using spheres of radii 1.9 cm and 25 cm, the smaller sphere being supported on a pendulum thread. Qualitative agreement was obtained for calculated and observed Coulomb forces, divergences being explained by the divergence of the experimental conditions from the ideal conditions assumed in Konorski's theory. A physical interpretation is offered of the results obtained. D.E.Brown

621.3.011

1130 MAXWELL'S EQUATIONS AND SYSTEMS OF ELECTROMAGNETIC UNITS. F.Odone.
Ingegnere, Vol. 33, No. 11, 985-90 (Nov.); No. 12, 1103-8 (Dec., 1959). In Italian.

A discussion of the problem of devising a uniform system of units for the various quantities involved in electromagnetic field theory. Suggested systems include modified versions of the Giorgi system, due to Perucca and Palacios respectively. V.G.Welsby

621.3.011.1

1131 TENSORIAL CONSEQUENCES OF MAXWELL' S EQUATIONS. P.Poincelot.
Ann. Telecomm., Vol. 14, No. 5-6, 106-10 (May-June, 1959). In French.

Maxwell' s equations are expressed in four-dimensional tensor form. Suitable forms of the continuity equation and the expression for the Lorentz force on a charged particle are also derived and the equation of motion of a charged particle in a general relativistic system is deduced. G.D.Sims

621.3.011.1

1132 STUDY OF ELECTROMAGNETIC POINT SOURCES. M.Bouix.
Ann. Telecomm., Vol. 14, No. 5-6, 143-50 (May-June, 1959). In French.

A theorem is proved which shows that any system of electromagnetic sources can be represented by a system of applied electric and magnetic currents flowing on a surface containing all the singularities of the system. Formulae are given for the currents in terms of the electric and magnetic field components at the surface. The current systems giving rise to some fields expressible in terms of spherical polar co-ordinates are derived and consideration of the field arising from a current element shows surprisingly that a magnetic as well as an electric applied current system is required to express the field adequately. G.D.Sims

621.3.066.6

1133 MECHANICAL AND ELECTRICAL CONTACT BETWEEN ROUGH SURFACES. E.Gruber.
Elektrotech. Z. (E.T.Z.) A, Vol. 80, No.21, 745-8 (Nov. 1, 1959). In German.

A mathematical representation of a rough surface is proposed and is applied to two surfaces in contact. The way in which the electrical resistance of the contact varies with pressure is calculated and is found to agree with experiment. P.M.Davidson

POWER RESOURCES
PRIME MOVERS

620.9

1134 ST. LAWRENCE RIVER DEVELOPMENT. VIII. THE BEAUHARNOIS LOCKS.
Engineer, Vol. 208, 19-21 (July 17, 1959).
For previous parts, see Abstr. 6189-94 of 1959,

620.9

1135 ST. LAWRENCE RIVER DEVELOPMENT. IX. INTERNATIONAL RAPIDS.
Engineer, Vol. 208, 671-4 (Nov. 27, 1959).

620.9 : 621.311.21

1136 ST. LAWRENCE RIVER DEVELOPMENT. X. THE ST. LAWRENCE POWER STATION.
Engineer, Vol. 208, 726-9 (Dec. 4, 1959).

The R.H. Saunders–St. Lawrence semi-outdoor power station contains thirty-two 51.25 MW sets operating under an average head of 83 ft. The alternators are each rated at 60 MVA, 13.8 kV three-phase, 60 c/s and 0.95 p.f. The power station construction and cofferdam are described.

620.9

1137 ST. LAWRENCE RIVER DEVELOPMENT. XI. INTERNATIONAL RAPIDS.
Engineer, Vol. 208, 766-8 (Dec. 11, 1959).

620.9

1138 ST. LAWRENCE RIVER DEVELOPMENT. XII. THE NIAGARA RIVER AND THE WELLAND CANAL.
Engineer, Vol. 208, 806-10 (Dec. 18, 1959).

620.91

1139 PRESENT-DAY POWER PROBLEMS. O.Gimstedt.
Svenska Vattenkr Fören. Publ. No.475, 238-69 (1959:8). In Swedish.

A survey of water power resources and constructional work in progress throughout the world. Cost of power and its effect on the Swedish economy is considered. Stations which entered service during 1958, new projects for both hydro and steam stations, lake regulation schemes and power line construction are listed and reviewed. Seven maps of development schemes are shown. Scandinavian power interchange, Swedish nuclear power plans and financing of new projects are examined briefly. G.N.Beck

620.93

1140 THE NUCLEAR POWER PROGRAMME FOR THE ELECTRICAL SUPPLY INDUSTRY. B.Nordström and Y.Larsson.
Tekn. T., Vol. 89, No. 46, 1289-92 (Dec. 11, 1959). In Swedish.

As the exploitation of further water power in Sweden will become increasingly difficult in the next decade, the economics of supplementary thermal and nuclear power are examined. With prevailing fuel costs, the costs of nuclear and thermal power are in the ratio 6-8 : 4. It is shown that if the optimum exploitation coefficient (ratio of water power generated in a normal year to the primary load) is around 110%, nuclear power need not be considered, if below 100%, it has greater possibilities. Curves are shown for the max. permissible cost of nuclear power with regard to economic generation for 90 and 110% exploitation factors. G.N.J.Beck

621.039

1141 POSSIBILITIES OF DIRECT ENERGY CONVERSION FROM FUSION REACTORS. J.D.Jukes.
Proc. Instn Elect. Engrs, Paper 2902 [Convention on Thermonuclear Processes] publ. April, 1959 (Vol. 106A, Suppl. No. 2, 173-6, 182-5).

Republication, with discussion, of the paper abstracted as Abstr. 2579 (1959).

621.165

1142 STEAM TURBINE CYCLES IN POWER STATIONS. K.Fenton.
Elect. Rev., Vol.165, No.8, 373-7 (Oct. 2, 1959).

Evaluates modern trends in steam cycle design. British practice does not go beyond 1050°F, and reheat cycles are being further developed. The cycles used in air-cooled nuclear-power plant are mentioned. P.Linton

621.165

1143 RECENT TRENDS IN THE DEVELOPMENT OF THE STAL TURBINE. C.R.Nicolin.
Electrotechniek, Vol. 37, No. 23, 532-7 (Nov. 12, 1959).

The Durax double-rotation radial-axial turbine is described, this being a development of the original Ljungström design which was based entirely on axial flow. It combines the advantage of the axial turbine when handling large quantities of steam with those of the radial turbine when dealing with small quantities. A Durax turbine rated at 110 MW has been built with four outlets for the Steningsund (Sweden) power station. The Durax design permits bleeding as well as the admission of large quantities of steam which make it suitable for use with district heating or nuclear power stations. G.N.J.Beck

621.221

1144 ON THE EFFECT OF PRESSURE SURGES IN PIPELINES ON THE REGULATION PROPERTIES OF WATER TURBINES. G.Hutarew.
Österr. Z. ElektWirtsch. (Ö.Z.E.), Vol. 12, No. 12, 579-82 (Dec., 1959). In German.

When the turbine flow is changed suddenly, the surge pressure may oppose this control if the pipe velocity is too high, causing risk of instability. The effect on the rate of power increase is also discussed. P.Linton

621.224

1145 COMPARATIVE STUDY OF KAPLAN AND DERIAZ TURBINES. P.Deriaz.
Elect. Rev., Vol.165, No.14, 647-52 (Nov. 13, 1959).

A design study based on 30000 h.p. machines under 180 ft head is fully discussed; model tests have shown the improved performance obtainable with the Deriaz variable-blade mixed-flow turbine. P.Linton

621.224

1146 MEASUREMENT OF BLADE PROFILE ON KAPLAN TURBINES. K.H.Fasol.
Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 20, 469-73 (Oct. 15, 1959). In German.

An arrangement for measuring blades in situ, consisting of two rails supported by bolts welded to throat and hub which carry a cross slide with a depth gauge. The method can be used to compare the actual blade profiles as well as the angular position of the blades at a certain servomotor position; the time required per blade was 2 days. P.Linton

621.224

1147 CALCULATION OF [HYDRAULIC] TURBINE LOSSES. K.I.Karlsson.
Svenska Vattenkr Fören. Publ. Medd. No. 156 (1959: No. 9) 67-81. In Swedish.

The hydraulic losses are investigated which a hydro-power station suffers on damming up a lower lying station. Diagrams are given to show how the losses in turbines vary with water flow for three types of turbine with various heads. It is shown how small is the extent to which losses depend on the head in certain cases: (1) with higher heads, when the water quantity exceeds the minimum loss value; (2) lower heads, when it lies below this value. G.N.J.Beck

621.224

1148 TESTS OF HYDRAULIC TURBINES. AN APPRAISAL. J.J.Trail.
Engng J., Vol. 42, No. 11, 66-74, 80 (Nov., 1959).

A summary of the methods of flow measurement of which the

author has experience, viz. current meters, salt velocity, pressure-time, and thermometric. Test costs and times required are included. Model turbine tests are not considered acceptable since complete similarity is rarely achieved, measurement of water flow and power are no more accurate, and there is no agreement on efficiency scale formulae. P.Linton

POWER SUPPLY
POWER STATIONS

621.311

1149 ELECTRICITY SUPPLY IN THE GERMAN FEDERAL REPUBLIC IN 1958. L.Erhard.
Elektrizitätswirtschaft, Vol. 58, No. 14, 478-93 (July 20, 1959).

621.311.1

1150 ELECTRICITY IN ETHIOPIA. T.Johansson.
E.R.A.(Stockholm), Vol.32, No.11, 137-9 (Nov., 1959). In Swedish.

On the liberation of Ethiopia in 1941 the generation capacity was 7400 kVA, 3900 kVA of this being hydro-electric. The corresponding figures for 1958 were 23 500 and 9700 kVA. That year consumption was 41 GWh. Private generation amounted to a further 10 GWh. The state supply authority operates 2 steam, 5 Diesel and 7 hydro-electric power stations. A 6350 kVA steam station is being installed by ASEA. Transmission voltages are 132, 45 and 15 kV, l.v. distribution is at 380/220 V. Consumption by private consumers is represented almost entirely by radio and lighting. G.N.J.Beck

621.311.1

1151 THE (SWEDISH) STATE WATER POWER BOARD'S BUDGET CLAIM.
Svenska VattenkrFören. Publ. Medd. 157, (1959:10) 91-144. In Swedish.

An abridgement of the report by the power station and water regulation authorities for the year 1958/59 and application for funds for 1960/61. The year 1958/59 was a favourable one from the power supply standpoint, precipitation being 109% of normal. The inflow to the state hydro-power stations was 120% of normal. Total consumption was 11 613 GWh, an increase of 694 GWh over the previous year. There was a more marked increase in exported power, 535 GWh to Denmark and 67 GWh to Finland. The actual load increase was less than that forecast by about 800 GWh, so an investigation of the country's economic structure has been made to arrive at a better basis of forecasting. Power station construction in progress and planned is listed and equipment requirements for the new financial year are given. Experience with the existing nuclear district heating station R3/Adam and the plans for the new nuclear power station R4/Eva are discussed. G.N.J.Beck

621.311.151

1152 THE INTER-CONNECTED POWER SYSTEMS OF NOVA SCOTIA AND NEW BRUNSWICK. G.D.Mader.
Engng J., Vol. 42, No. 10, 68-72 (Oct., 1959).

Interconnection of the systems of the New Brunswick Electric Power Commission, the Nova Scotia Power Commission and the Nova Scotia Light and Power Co. is expected by March 1960, for which new 138 kV lines are being constructed and substations extended. This short article deals with economic and operational aspects. Other authorities will probably participate later. A.P.Wilmshurst

621.311.154

1153 A METHOD FOR THE COST CALCULATION OF REACTIVE POWER. I.Helyi.
Elektrotechnika, Vol. 52, No. 7, 289-99 (1959). In Hungarian.

A treatment is given for the calculation of various items of costs for generating reactive power on the assumption that only those costs should be associated with the generation costs of real power which inevitably occur when the supply is provided at unity power factor. Examples are quoted. L.Csuros

621.311.16

1154 THE GENERAL THEORY OF STABILITY OF LYAPUNOV AND PROBLEM OF STABILITY OF POWER SYSTEMS. L.V.Tsukernik.
Elektrichestvo, 1959, No. 1, 13-17 (Jan.). In Russian.

The general outline of Lyapunov's method is given. It may be used only for small perturbations applied for a short time and without permanently applied perturbing forces. Other authors have obviated these limitations and the method may then be applied to power systems to deal with problems of long transmission lines and synchronization. M.W.Makowski

621.311.2 : 621.359.4

AN ELECTROSTATIC DUST MONITOR. See Abstr. 769

621.311.21

1155 WILLINGTON "A" POWER STATION.
Elect. J., Vol. 163, No. 15, 658-60 (Oct. 9, 1959). Also in Elect. Rev., Vol. 165, No. 9, 431-2 (Oct. 9, 1959); Elect. Times, Vol. 136, 353-68 (Oct. 8, 1959).

See Abstr. 25 (1960). Located between Derby and Burton (England), the station has four 100 MW sets fed by outdoor-type boilers. 1500 lb/in^2 1050° F 3-cylinder turbines drive 13.8 kV hydrogen-cooled alternators. Two sets are switched at 132 kV over 3500 MVA oil-circuit-breakers, the others at 275 kV through 7500 MVA oil-circuit-breakers. A second station with two 200 MW sets is planned on an adjacent site. P.Linton

621.311.21

1156 WHITEDOG FALLS AND CARIBOU FALLS GENERATING STATIONS. HYDROELECTRIC DEVELOPMENTS ON THE WINNIPEG AND ENGLISH RIVERS. N.S.Haines.
Engng. J., Vol. 42, No. 10, 73-84, 95 (Oct., 1959).

Whitedog Falls on the Winnipeg is a concrete gravity dam with 9 gates and a log chute; the generating station incorporated in dam structure contains 3 propeller turbines running at 105.9 rev/min under 50 ft head and driving 24 MVA 13.8 kV alternators. Caribou Falls on the English River is similar in construction and contains 3 propeller turbines running at 112.5 rev/min under 58 ft head and driving 28.5 MVA 13.8 kV alternators. The stations are close together and both discharge into Lake Seul; each has three 1-ph. 138 kV transformers and there is a common h.v. switching station. Both stations are operated remotely from Kenora. P.Linton

621.311.21

1157 OTTENSTEIN POWER STATION OF THE NEWAG. E.Kumersteiner.
Österr. Z. ElektWirtsch. (Ö.Z.E.), Vol. 12, No. 10, 515-28 (Oct., 1959). In German.

This pumped storage station of the Kamp, Lower Austria, comprises one turbine and two pump-turbine sets (with space for a third). The 250 rev/min vertical-shaft sets have 13.5 MVA 6.3 kV alternators and operate under 39.5-59 m head. The pumps are started empty and brought up to 102% speed by a 250 kW motor with hydraulic coupling; the gear coupling on the main shaft can be engaged with up to 5% slip. Starting and stopping are fully automatic, the change-over from generating to pumping taking 3 min. The output is fed to a 60/110 kV substation with 1000/2000 MVA airblast circuit-breakers. The peak efficiency of the turbine set is 97.67%. P.Linton

621.311.21

1158 DETAILS OF THE AUXILIARY DEMAND IN WATER POWER STATIONS. W.Nemetz.
Österr. Z. ElektWirtsch. (Ö.Z.E.), Vol. 12, No. 11, 558-63 (Nov., 1959). In German.

A review of the various possible combinations of house set, transformers and external sources. Different auxiliary power systems are described and details from the major Austrian power plants are given. P.Linton

621.311.21

1159 THE NEW HYDROELECTRIC STATION AT ORLU (ARIÈGE). P.Dewavrin.
Rev. Jeumont, Vol. 51, No. 44, 195-212 (Oct.-Dec., 1958). In French.

The station replaces an old one of 15.3 MVA. A thin-arch dam 55 m high and 151 m long raises the level of the Etang de Naguilhes. A pressure gallery 2000 m long followed by a steel penstock of 2147 m leads to the power station which contains two 42.5 MVA sets. Two overhung single-jet Pelton turbines under 976 m head drive a common 600 rev/min 11.5 kV alternator. Two transformers connect to the 165 kV transmission line. Full details of the mechanical design of alternator and turbine are given. P.Linton

621.311.21

1160 LARGE-SCALE PUMPED STORAGE. I.
Water Pwr, Vol. 11, No. 8, 288-94 (Aug., 1959).

Describes the Illwerke system, Vorarlberg (Austria) with special reference to the Lünersee pumped storage station. From the Silvretta reservoir at 2030 m a series of power stations along the Ill produce 29, 140 and 170 MW; a further six stations are planned downstream. The Lünersee on a tributary has 217 MW generating and 253 MW pumping capacity. Details of tunnelling and the site railways are given. P.Linton

621.311.21

1161 LARGE-SCALE PUMPED STORAGE. II.
Water Pwr, Vol. 11, No. 9, 327-34 (Sept., 1959).

Details of machinery are given (see preceding abstract for general description). The pumps are started full by a torque converter, followed by engagement of a dog clutch; change-over from generating to pumping takes 80 sec. The house service set is connected to the Bürz substation which also receives the output of the other Upper Ill stations and transmits it to Germany over two 2-circuit lines. Details of economies expected and the financing of the project are given. P.Linton

621.311.21

1162 KUNDAH HYDRO-ELECTRIC PROJECT.
A.Dharmalingam.
Water Pwr, Vol. 11, No. 10, 367-74, 392 (Oct., 1959).

This large project in Madras State will be developed in four stages, and the three power stations will utilize a gross head of about 5200 feet. The two power houses of the first two stages (to be completed by 1961) will have 6 generators with multiple-jet vertical Pelton wheels, with a combined capacity of over 200 MVA, including 4 large units of 42 000 kVA each, at 11 kV. The utilization of the Kundah river and tributaries will be 50% per annum, the initial storage capacity will be on a 70% p.a. basis. The 2 main reservoirs have a capacity of 5500 and 3572 $ft^3 \times 10^6$. The power will be fed into the Madras grid through 110 kV and 230 kV lines. J.Smuts

621.311.21

1163 HYDRO-ELECTRIC POWER IN FORMOSA.
Water Pwr, Vol. 11, No. 11, 425-8 (Nov., 1959).

A survey of the Ta-Chia valley development scheme.

621.311.21

1164 SOME HYDRAULIC FEATURES OF PUNTLEDGE GENERATING PLANT. I-II.
A.W.Lash and R.E.Passmore.
Water Pwr, Vol. 11, No. 11, 429-35 (Nov.); No. 12, 452-56 (Dec., 1959).

621.311.21 : 620.9

ST. LAWRENCE RIVER DEVELOPMENT. X. THE ST. LAWRENCE POWER STATION. See Abstr. 1136

621.311.22

1165 SANTA BARBARA, A NEW STEAM POWER STATION IN ITALY. A.Angiolini and E.Maraini.
Brown Boveri Rev., Vol. 46, No. 3, 163-81 (March, 1959).

Describes the equipment of this new power station in Italy which, with an output of 250 MW, is the largest thermal plant in the country. The station utilizes the deposits of lignite from the surrounding area. This fuel is employed to heat two boilers, each having a capacity of 375 tons of steam per hour. Each boiler supplies a three-cylinder steam turbine driving a 125 MW alternator by direct coupling. The alternators are connected direct to the 120- and 220-kV transmission systems through transformer banks rated 3 × 53.3 MVA. The various auxiliaries are designed to be able to maintain the service even if there should be a breakdown anywhere.

621.311.23

1166 GAS TURBINE-GENERATORS OPERATION, LIMITATIONS AND APPLICATIONS. H.Farrington.
Elect. Rev., Vol. 165, No. 18, 832-6 (Dec. 11, 1959).

Operation of the open-cycle gas turbine and factors affecting its efficiency are described with particular reference to turbine inlet temperatures and the type of fuel used. The applications of gas turbines to base- and peak-load generation are discussed and two methods of integrating gas turbines into steam turbo-alternator cycles are presented.

621.311.23

1167 HIGH-POWERED GAS TURBINES [FOR GENERATOR DRIVES]. P.Chambadal.
Tech. mod., Vol. 51, No. 10, 505-12 (Oct., 1959). In French.

See also Abstr. 4471 (1959). An illustrated survey of gas turbines for power-station use, covering single-, double-, and three-shaft types coupled to generators up to 40 MW.

621.311.25

1168 SOME ASPECTS OF THE CONTROL OF NUCLEAR POWER STATIONS. D.von Haebler.
Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 22, 535-9 (Nov. 15, 1959). In German.

The performance of an unregulated reactor is discussed in order to illustrate the effect of changes in reactivity on neutron flux, fuel temperature and poisoning fission products. From these data optimum operating procedure for a power reactor can be inferred. A.E.I. Research Laboratory

621.311.25

1169 THE CONTROL OF REACTORS.
A.O.Burtscher.
Elektrotech. u. Maschinenbau (E. u. M.), Vol. 76, No. 22, 539-46 (Nov. 15, 1959). In German.

Introduces the non-specialist reader to the fundamental processes of reactor physics. The complete reactor is considered as a servo-mechanism and a mathematical model is employed to describe its behaviour and to enable quantitative calculations to be made.
A.E.I. Research Laboratory

621.311.25

1170 THE REACTOR CENTRE AT PETTEN [HOLLAND]. II. GENERAL INTRODUCTION.
III. AUXILIARY INSTALLATIONS OF THE NUCLEAR REACTOR NEAR PETTEN. J.H. van der Torren.
Ingenieur, Vol. 72, No. 1, A3, A3-A8 (Jan. 1, 1960). In Dutch.

For Pt I see Abstr.6924(1959). Part II gives a very brief account of the organization of the project and the bodies participating. Part III deals with: (1) the primary and secondary water cooling systems; (2) the 20-ton travelling crane for the erection of the reactor pool liner and beam holes; (3) the electrical installations. The latter comprise a special 10 kV cable link with the Schagen associated power station. The n.v. is transformed down to 380 V in three transformer substations which supply the primary and second pumping stations respectively, and the chemical laboratory. An automatically started Diesel generator set for 100 kVA and a Diesel-driven water pump are also installed. G.N.J.Beck

621.311.25

1171 FUTURE DEVELOPMENTS IN POWER REACTORS.
A.J.Salmon.
Naturwissenschaften, Vol. 46, No. 18, 521-8 (1959). In German.

This survey is restricted to fission reactors which will, or could be, producing power in the period 1958-68. It provides a comprehensive review of the field as it appeared after the 1958 United Nations Conference at Geneva. National efforts in the production of electricity are described and the various types of reactor, for either stationary or mobile use, are discussed. No discussion of thermonuclear devices is attempted.
A.J.Salmon

621.311.25

1172 ROCK CAVERN AS PRESSURE VESSEL FOR A NUCLEAR REACTOR. T.Lindbo.
Tekn. T., Vol. 89, No. 43, 1203-8 (Nov. 20, 1959). In Swedish.

It is shown that graphite-modulated and CO_2-cooled reactor of the British type can be built underground in rock with the walls of the rock cavern itself serving as pressure vessel. It is shown that the cavern can withstand pressures up to about 80 × 981 kg/cm^2, if the pressure-transmitting medium is gas and if the rock temperature can be kept below 50°C. Rock stresses were determined by an optical stress method and theoretical and experimental results are discussed. G.N.J.Beck

621.311.25 : 621.317.79

NUCLEAR POWER STATION INSTRUMENTATION.
See Abstr. 750

621.311.4

1173 DESIGN FEATURES OF 40 000 kVA UNDERGROUND DISTRIBUTING STATION. C.M.Short and F.C.Osborn.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 885-90 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959)

The total installed capacity of this station is 60 MVA, transforming from 34.5 to 5 kV, in a structure 65 by 126 by 18ft high. Switchgear on the h.v. side is of conventional oil-filled type; the three transformers are forced-oil forced-air cooled, having individual cooling air supplies from outside, with separate ventilation for the remainder of the station. The building also houses all control and protection equipment, of which details are given.

M.R.Dickson

ELECTRIC MACHINES

621.313.1

1174 THE USE OF ELECTRICAL MOTORS IN TROPICAL CLIMATES. M.Chorein.
Bull. Soc. Franc. Elect., Vol. 9, 533-6 (Sept., 1959). In French.

The elements involved in a so-called tropical climate are enumerated as follows: humidity; dew-formation; temperature; fungus; wind and dust; transport by inexperienced people. Means of protection are also discussed: enclosure of the motor; protection of metal surfaces; insulation of the windings; long leads to a separate terminal-box; heating during off-periods. Several examples of actual experience are given. It is concluded that all the problems have been solved.

R.G.Jakeman

621.313.1

1175 THE MECHANICAL COUPLING EFFECT OF THE UNILATERAL MAGNETIC PULL IN ELECTRICAL MACHINES. II. E.Swatosch.
Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 15-16, 378-83 (Aug. 15, 1959). In German.

For Pt I, see Abstr. 5689 (1959). The oscillation phenomena in rotating machines are determined by the forces of excitation, inertia, attenuation and eccentricity, as well as by the unilateral magnetic pull which causes mechanical oscillations in both stator and rotor. The oscillatory effects of the magnetic pull are developed mathematically and discussed with particular reference to the critical speed.

H.Norel

621.313.1

1176 AIR GAP OF AN ELECTRICAL MACHINE, ITS THIRD MAIN DIMENSION. A.J.Berger.
Elektrotech. Obzor, Vol. 48, No. 10, 510-13 (1959). In Czech.

The other two main dimensions are diameter at the air gap and active length. Discusses influence of air gap upon essential data, losses, shaft deflection, overload capacity, noise and others.

N.Klein

621.313.1

1177 SURFACE LOSSES IN ELECTRICAL MACHINES ON NO-LOAD RUN. F.Provazník.
Elektrotech. Obzor, Vol. 48, No. 11, 566-72 (1959). In Czech.

Derives relations from Maxwell equations for the surface losses caused by the influence of slots and teeth on the rotating magnetic field. In addition to known results the increase in these losses by magnetic saturation is calculated. Relations, both for machines with solid and with laminated poles are derived. Theoretical results obtained are compared with empirical data used for design. The latter, as given in the literature, vary greatly. A calculated example is given.

N.Klein

621.313.1

1178 STABILITY AND OTHER RESULTS OF THE ROTATING MACHINE OSCILLATOR. C.V.Govinda Rao.
J. Franklin Inst., Vol. 268, No. 4, 297-312 (Oct., 1959).

A separately excited d.c. motor supplied from a d.c. series generator performs an unusual type of oscillation. For a reasonably clear understanding of the electromechanical phenomenon underlying this behaviour, a nonlinear differential equation is developed and its complete solution is obtained by partially graphical and numerical methods. In particular Lienard's method is adopted to examine the possibility of any periodic solutions. In this method periodic solutions are easily recognized by the presence of the so-called "limit cycles", their number being equal to the number of such loops. Of these, one or more may give stable solutions and the rest unstable. In the investigations reported two limit cycles in general are observed of which one and only one represents stable oscillations. The existence of these limit cycles itself is found to depend on various factors such as the polar movement of inertia, shaft load, brush shift, circuit resistance and excitation. The discussion is limited to the effects of variation of the first three factors and in the main the stability of oscillations. Any additional facts observed are also recorded.

621.313.1 : 621.315.616.7

1179 SILICONE MATERIALS IN ELECTRIC MACHINE CONSTRUCTION. H.Kallas.
Elektrotech. Z. (E.T.Z.) B, Vol.11, No.10, 398-404 (Oct. 21, 1959) In German.

A survey of various class H and class F insulation materials employing silicone resins and silicone rubber. Special attention is given to recently developed wire coverings and composite slot insulating materials with improved mechanical and electrical characteristics. Impregnation, slot wedge materials, lubrication and brushes for class F and class H insulated machines are briefly discussed. Curves, tables and photographs illustrate the characteristics of the various materials. A bibliography is included.

H.Sterling

621.313.1 : 621.315.617.3

1180 SOLVENTLESS IMPREGNATING VARNISHES. P.Nowak and F.Weber.
Elektrotech.Z. (E.T.Z.) B, Vol.11, No.10, 409-11 (Oct. 21, 1959). In German.

Loss of varnish during stoving, cavities due to evaporation of solvents, difficulties in removing surplus varnish and in the application of mass-production methods are some of the disadvantages of using conventional impregnating varnishes for electric motor windings. It is claimed that these disadvantages can be avoided by the use of solventless impregnating varnishes. An impregnation method, which allows the varnish to drip into the hot, rotating windings is described and is claimed to be particularly suitable for the mass production of small machines. The properties of various types of solventless varnishes are discussed with the help of curves.

H.Sterling

621.313.1 : 621.315.61

1181 THE ESTABLISHMENT OF A BASE FOR CLASS A RANDOM-WOUND-MOTOR INSULATION LIFE BY A.I.E.E. STANDARD NO. 510 TEST PROCEDURE AND ITS CORRELATION WITH FIELD EXPERIENCE. R.L.Balke and D.R.Blake.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 660-5 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

A reasonable correlation is shown for extrapolated life from motor tests of an insulation system Z used since 1941, and the actual life in practice. A modern system Y provides longer life. Tables show thicknesses and materials of the various components, heat and humidity exposure periods at 100 to 195°C, and hours for actual failure with stabilized analysis.

H.F.Hunt

621.313.1

1182 NUMERICAL METHOD OF CALCULATING EDDY CURRENTS RESULTING FROM COMMUTATION. A.I.Dvoracek.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 732-6 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

Instead of using the usual cumbersome general solution, a direct numerical method of calculating eddy currents induced in armature slot conductors by the change of slot cross-field during and after commutation is developed. The method involves dividing the procedure into a certain number of time and space elements and it is suitable for use with a digital computer. Simple calculations are given and they are compared with the general solution, showing sufficient accuracy. A short discussion is added.

R.G.Jakeman

621.313.1 : 621.317.44

USE OF HALL PROBES FOR THE INVESTIGATION OF THE MAGNETIC FIELD IN THE AIR GAP OF ROTATING ELECTRICAL MACHINES. See Abstr. 741

621.313.1.047.4

1183 THE EFFECT OF VARIABLE HIGH-ALTITUDE HUMIDITY ON THE WEAR OF NONDUSTING BRUSHES. L.E.Moberly and J.L.Johnson.
Trans Amer. Inst. Elect. Engrs II, Vol. 78, 263-7 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

Dusting wear of carbon brushes occurs at high altitudes due to the extremely low air humidities encountered. Specially treated brushes are not subject to dusting wear but may wear erratically in flight tests. An altitude test chamber in which dew point can be accurately controlled was used for testing three types of altitude brush whose principal filming agent was molybdenum disulphide. With pressure held constant to simulate an altitude of 60 000 feet brush wear rates were found to be a function of absolute humidity. Since there is meteorological evidence of fluctuations in the humidity of the atmosphere at flight altitudes the variations in brush wear rate which have occurred in actual flights can be explained. There is a bibliography. T.J.Anderson

621.313.1.047.4

1184 CONTRIBUTION TO THE THEORY OF THE BRUSH-COLLECTOR CONTACT. E.Holm.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 431-8 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

Carbon brushes moving on a copper collector produce resisting films which, if a current is to flow, must be penetrated electrically, producing conducting spots. In consequence the contact voltage depends largely on these films. Their properties are studied in detail. P.M.Davidson

621.313.1-9

1185 FIREDAMP- AND EXPLOSION-PROOF ELECTRIC MOTORS. G.Frey and R.Sack.
Dtsch. Elektrotech., Vol. 13, No. 5, 158-64 (May, 1959). In German.

The requirements of the German Standards have recently been revised and the effect of these revisions on the detailed construction of these motors is discussed. The factors to be guarded against in the design are explained. The types considered are pressure-tight enclosures, motors with increased safety, separately ventilated motors. The limits for the selection of the most suitable type are given. R.G.Jakeman

621.313.1-9

1186 REVIEW OF THE CONSTRUCTION AND SELECTION OF EXPLOSION-PROOF 3-PHASE INDUCTION MOTORS. R.Kretzschmann.
Dtsch. Elektrotech., Vol. 13, No. 5, 165-8 (May, 1959). In German.

See also preceding abstr. A discussion of the constructional and design details of 3 types of motor: motors with increased safety; separately ventilated motors; pressure-tight enclosures. R.G.Jakeman

621.313.2

1187 ON IMPROVING CONDITIONS OF COMMUTATION IN DIRECT CURRENT MACHINES. N.S.Klimov.
Elektrichestvo, 1959, No. 8, 78-80 (Aug.). In Russian.

Several variants of a scheme for reducing the arcing at commutators by the use of rectifiers in series with the brushes are briefly described. Such a scheme using a double commutator, a double set of brushes and thyratrons was tested on a 15 kW machine in 1936 with promising results, here published for the first time, as such schemes become attractive with the semiconductor diodes now available. F.Quelon

621.313.2-9

1188 THE SYNCHRONIZED D.C. MOTOR H.Völz.
Elektron. Rdsch., Vol. 13, No. 9, 328-30 (Sept., 1959). In German.

Instead of the usual method of employing synchronous motors to provide matched speeds in small drives, it is proposed to use a d.c. motor having sliprings connected to tappings on the armature winding and also an a.c. auxiliary winding on the armature. The theory is investigated and the characteristics developed. It is shown that the a.c.power required for a given torque is much less than for the synchronous motor. R.G.Jakeman

621.313.2-9

1189 A PULSE MOTOR. Shen Guang-ming.
Science Record (China), New Series, Vol. 3, No. 7, 318-26 (July, 1959).

To illustrate the design, a motor having a 10-toothed rotor and a 4-pole stator is considered. Pairs of poles are energized alternately with pulses. The tooth profile is shaped to produce a tangential torque which moves the rotor until a stable position of zero torque is reached for the particular pair of energized poles. The other pair of poles now cover another pair of teeth which are potentially in the unbalanced torque position, awaiting the latter pole-pair to be energized. Hence the motor may be stepped on with angular increments equal to half the tooth pitch. A simple thyratron switching circuit is described which provides the field input. The paper is clearly presented and illustrated to support the theory covering both static and dynamic characteristics. K.C.Garner

621.313.2-9 : 621.314.6

1190 THE ARMATURE CURRENT FORM FACTOR OF A D.C. MOTOR CONNECTED TO A CONTROLLED RECTIFIER. E.F.Kubler.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 764-70 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

Derives from first principles a formula for the form factor when the armature e.m.f. and speed are low and the current flows in pulses. The conduction angle is determined graphically in terms of the firing angle, and substituted in the formula. The form factor was calculated on a digital computer for several different time-constants, and for various motor e.m.f's. and supply voltages. The results are shown in 13 graphs, and to illustrate their use, the power factor is determined from them for a motor operating at 40% maximum input voltage fed by a full-wave rectifier. The reactance necessary to improve the power factor and the corresponding reduction in losses are calculated. The adaptation of the method for a three-phase rectifier is described. E.F.Hansford

621.313.226.3 : 621.375.68

1191 SOME OF THE MAIN CONNECTION METHODS FOR THE "AUTODYNE". O.Benedikt.
Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 20, 473-80 (Oct. 15, 1959). In German.

The "autodyne", which has been described by the author in earlier articles (see Abstr. 3927, 6940 of 1959), is a new rotating amplifier based on the rotary convertor. The author claims that the machine can replace conventional Ward Leonard motor-generator sets, permitting stepless control of the d.c. output voltage with small control signals and with good steady-state and transient commutation, while feeding large amounts of reactive kVAr to the a.c. supply. Various control schemes employing negative feedback are described with connection diagrams and performance curves. These include connections for constant voltage and constant current, or the variation of these quantities according to predetermined laws. Some practical applications of the machine are briefly described. H.Sterling

621.313.3

1192 A NEW STATOR TRANSPOSITION FOR LARGE MACHINES. W.L.Ringland and L.T.Rosenberg.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 743-7 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

A new transposition method for a.c. machines above 134MVA is described. The conventional, 360° Roebel transposition only minimizes the eddy-current loss in the slot portion. To reduce this loss in the end-winding, additional measures are required. It is claimed that the new 540° transposition protects against slot- and end-induced eddy currents without the need for the cumbersome group connectors formerly used at the U-bends. Comparative test results and a short discussion are included. H.Sterling

621.313.3

1193 DIFFERENTIAL LEAKAGE OF 3-PHASE WINDING WITH CONSEQUENT POLE CONNECTION. C.H.Lee.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 759-64 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

The equations are developed by means of Goerges diagrams for the differential leakage of 3-ph. 120 deg. phase-belt windings neglecting damping. Several numerical examples are given and curves are drawn of leakage against coil-pitch for various numbers of slots. A short bibliography and a discussion are added. R.G.Jakeman

621.313.32

1194 CURRENT DIAGRAMS FOR THE NONSALIENT-POLE SYNCHRONOUS MACHINE. H.Henning.
Elektrotech. u. Maschinenbau (E.u.M.), Vol.76, No.15-16, 384-8 (Aug. 15, 1959). In German.

The method used in a previous article (see Abstr. 6279 of 1959) has been found to have drawbacks, since it requires a new current triangle for each value of load current. To overcome this, new equations are developed in which the values are reduced to the rated stator current and to the no-load excitation current. An important factor in the method is the ratio of the s.c. current at no-load excitation to the rated current. Diagrams are developed and simple formulae are obtained. R.G.Jakeman

621.313.32

1195 THE ESTABLISHMENT OF STEADY STATE STABILITY CONDITIONS FOR MULTI-MACHINE SYSTEMS. B.Bókay.
Elektrotechnika, Vol. 52, No. 7, 320-6 (1959). In Hungarian.

A method is given for assessing steady-state stability conditions on the basis of the exciter current, stator current and reactive power of a synchronous machine irrespective of the operating conditions of other synchronous machines connected to the network. L.Csuros

621.313.32

1196 A NOTE ON SYNCHRONOUS MACHINE CIRCLE DIAGRAMS. E.Montalto.
Ingegnere, Vol. 33, No. 11, 1007-12 (Nov., 1959). In Italian.

Using the concept of synchronous impedance, circle diagrams are derived for synchronous machines when motoring or generating. The modes of operation in conditions of constant excitation, constant current and constant voltage are examined and the effect of neglecting the stator resistance demonstrated. M.Rathbone

621.313.32 : 621.317.37

MEASUREMENT OF THE TORQUE-ANGLE IN SYNCHRONOUS MACHINES. See Abstr. 730

621.313.322

1197 RECTIFIER EXCITATION FOR 3-PHASE SYNCHRONOUS GENERATORS. H.Reichmann and Y.Rogowsky.
A.E.G. Mitt., Vol. 48, No. 11-12, 676-81 (Nov.-Dec., 1958). In German.

After enumerating the disadvantages of exciters for large machines, a system using grid-controlled rectifiers is described. The principal characteristics as regards regulation, response, protection etc. are discussed. Test results, including numerous oscillograms, on a 10 MW turbo-alternator are given. A bibliography is added. R.G.Jakeman

621.313.322 : 621.315.17

1198 A POSSIBLE MEANS OF INCREASING THE POWER WHICH CAN BE CARRIED BY A TRANSMISSION LINE. C.Hamdi-Sepen.
Rev. gen. Elect., Vol. 68, No. 10, 605-7 (Oct., 1959). In French.

The maximum power which can be carried by a transmission line is limited by the stability of the alternator. If the angle of lag of V over E approaches 90° the machine becomes unstable and in practice the angle of lag must be kept well below this figure in order to achieve a sufficient margin of stability. Conventional methods of increasing the maximum limit of power which can be transmitted are the use of capacitors to improve the power factor of the line and ultra-rapid circuit breakers to isolate the alternator in the event of a fault before serious damage can occur. The incorporation in the alternator of a second field winding having its magnetic axis at 90° to the main winding is proposed. This would be energized automatically as soon as synchronism is lost and the relationship between E and V would be corrected. Advantages claimed for this arrangement are: (1) a large increase in maximum tranmissible power; (2) more economic conditions of transmission; (3) ultra-rapid circuit-breakers are no longer essential; (4) the alternator can continue to transmit full power in the event of a transient or intermittent fault; (5) in the event of need to isolate the alternator, conditions for reconnection are not critical. D.R.Way

621.313.322-8

1199 THE STATIONARY SHORT-CIRCUIT CURRENT WITH SYNCHRONOUS GENERATORS. R.Gårding.
E.R.A. (Stockholm), Vol.32, No.11, 134-7 (Nov., 1959). In Swedish.

A simple numerical method is developed for calculating the s.c. currents with and without connection to the network. The method is based on the fact that the ratio of the two machine constants, the armature reaction at the magnetizing current corresponding to rated current and the magnetizing current at no-load or rated voltage, can completely replace these two constants. The ratio is called the "relative" armature reaction. Working with relative (percent) quantities for currents, voltages, resistances, etc. enables the size of the machine to be eliminated and a more general survey to be obtained. G.N.J.Beck

621.313.322-62

1200 ON THE DETERMINATION OF THE LOSSES IN ELECTRIC GENERATORS BY THE CALORIMETRIC METHOD. F.Aemmer.
Bull. Assoc. Suisse Elect., Vol. 50, No. 24, 1165-70 (Nov. 21, 1959). In German.

The losses of large, low-speed, water-wheel alternators can usually not be measured by conventional methods. Tests which were carried out on three 28 600 kVA, 22 000 kW 68.2 r.p.m. closed-air circuit, water-cooled alternators to obtain the losses by calorimetric means are described. Tests were taken to evaluate the various losses separately and the results so obtained were compared with calorimetric test results for total losses. Very good agreement was obtained. It is claimed that the demands of instrumentation, time and personnel for calorimetric testing are not excessive and that the method is reliable and useful for the testing of large machines. H.Sterling

621.313.323

1201 GEOMETRIC DERIVATION OF THE ARMATURE CURRENT LOCUS OF A SALIENT POLE SYNCHRONOUS MOTOR. E.Kübler and D.Labahn.
Elektrotech. Z. (E.T.Z.)A, Vol. 80, No. 21, 749-50 (Nov. 1, 1959). In German.

Due to different fluxes in the longitudinal and transversal directions the salient pole machine exerts a torque even without excitation. The circle diagram of such an unexcited machine is first derived. When excitation is added the armature current locus becomes a Pascal spiral. The derivation of this curve from the circle diagram is described and it is shown how the excitation current may be calculated from the current component used in deriving the Pascal spiral from the circle diagram. R.Neumann

621.313.332

1202 ASYNCHRONOUS MACHINES WITH MAGNETICALLY ACTIVE, SOLID ROTOR YOKE. A.Grabner.
Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 15-16, 369-73 (Aug. 15, 1959). In German.

Proposals are made for raising the maximum output of two-pole induction machines to about 500 MVA and to use them as induction generators in place of synchronous machines. An experimental two-pole machine was built to test the possibility of using the maximum amount of solid rotor iron in order to increase the mechanical rigidity of the rotor. It has several unusual features, including dovetailed laminated teeth with small projections at the bottom to form a minature laminated yoke, which helps to reduce the loss in the solid yoke due to slot harmonics. Test results, photographs and diagrams showing constructional details of the experimental machine are included together with sectional drawings of the draft design for a 350 MVA machine. H.Sterling

621.313.333

1203 INDUCTION MOTOR LOSSES. O.E.Mainer and J.R.Edwards.
Elect. Rev., Vol. 166, No. 3, 103-5 (Jan. 15, 1960).

Large induction motors using the Scherbius system and polyphase commutator motors operate over wide speed ranges and there are consequently good practical reasons for studying rotational iron losses. The theory of these losses is considered and curves based on theory and experiment are compared. Curves of surface drag losses are also discussed.

621.313.333

1204 A STUDY OF STARTING CONDITIONS OF 2 PHASE SQUIRREL CAGE ROTOR INDUCTION MOTORS CONNECTED TO SINGLE PHASE SUPPLY SYSTEMS. L.Kovács.
Elektrotechnika, Vol. 52, No. 7, 315-19 (1959). In Hungarian.

An analysis is given of the technical features and parameters relating to the most favourable starting conditions, i.e. those resulting in symmetrical voltage and current and pure rotating field L.Csuros

621.313.333

1205 MEASUREMENT OF END-WINDING LEAKAGE REACTANCE. V.B.Honsinger.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 426-31 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

The measurement of end-winding leakage reactance involves a separation of this reactance from the total reactance. Die-cast squirrel-cage induction motors are studied by covering various shapes of coil, extending the range of experiment and correlating results obtained by the author with data obtained by others.

G.V.Hargreaves

621.313.333

1206 ROTOR IMPEDANCE CONTROL OF THE WOUND-ROTOR INDUCTION MOTOR.

W.Shepherd and G.R.Slemon.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 807-14 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

An analytical method is suggested for the synthesis of rotor impedance networks to obtain prescribed speed–torque characteristics from slipring induction motors. It is shown how a constant torque characteristic between slip values of 2.0 and 0.2 can be obtained by an external impedance network employing resistances and inductances. Another example shows how variable-speed characteristics, which are claimed to be suitable for stable hoist control at low speeds and for a wide range of torques, are obtained by the use of an external resistance in series with a variable capacitance. Locus diagrams and speed–torque curves are given.

H.Sterling

621.313.333.2

1207 SYNTHESIS OF DOUBLE-CAGE INDUCTION MOTOR DESIGN. H.E.Jordan.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 691-5 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

By means of some approximations, 3 basic equations are developed for the resistances and reactances of the double cage, the values of breakdown and locked-rotor torque being selected by the designer. It is shown how the equations can be used for a computer programme and numerical figures are given for a sample design.

R.G.Jakeman

TRANSFORMERS

621.314.2

1208 REDUCED TRANSFORMER INSULATION PAYS OFF. A.C.Kemppainen, H.Fossum and L.W.Schoenig.

Elect. Wld, Vol. 152, No. 10, 48-9 (Sept. 7, 1959).

An illustrated description of a 46.6 MVA substation autotransformer installation of the Northern States Power Co., Minneapolis. The transformer is fitted with reduced insulation. Tables show the reduction in prime costs, losses, weights and dimensions if the b.i.l. (basic impulse level) is reduced by one or several classes. A thorough study of the power system was made to determine the feasibility of using a reduced insulation transformer and the following conditions were taken into consideration: continuous normal voltages, continuous overvoltages, fault voltage, switching surge voltages, impulse voltages. A special study was made on the coordination of the transformer insulation with the protection afforded by the lightning arresters. Curves show the coordination margin for different b.i.l. windings on the h.v. and l.v. side.

R.Neumann

621.314.2

1209 SURGE LOADING OF H.V. DISTRIBUTION TRANSFORMERS WITH CHOPPED OVERVOLTAGE WAVES.

J.Jirků and D.Domanský.

Elektrotech. Obzor, Vol. 48, No. 9, 472-8 (1959). In Czech.

Investigates the voltage distribution in windings with continuous and stepped insulation of the outer coils, when the parameters change, as the distance of the protecting spark gap and time when the wave is chopped. The influence of additional capacitance on the reduction of the overvoltage is considered. Some experimental results are shown and a method for the indication of a defect in the first coils of the winding is given.

N.Klein

621.314.2

1210 THE MODELLING OF SHORT-CIRCUIT FORCES OF TRANSFORMERS. J.Kulda and J.Adamt

Elektrotech. Obzor, Vol. 48, No. 11, 572-5 (1959). In Czech.

Develops the theory of models for short-circuit forces and shows that the model has to be equal in size to the original. Indirectly, however, smaller electromagnetic models can be used. The mechanical design of windings and their fixtures depends mainly upon the axial components of short circuit forces. The latter can be comparatively easily determined with the help of magnetic field data measured on the model. Results of field measurements on a model are compared with measurements on the original transformer.

N.Klein

621.314.2 : 621.318.424

1211 JOINT FACTORS IN STACKED MAGNETIC-CORE DESIGN. D.M.Douglas.

Elect. Manufng, Vol. 64, No. 3, 117-23, 192 (Sept., 1959).

Magnetic design and material application for stacked cores as used in E-I transformers are greatly facilitated by separating inherent material properties from the effects of core joints and other mechanical aspects. A method for doing this is outlined, supported by illustrative test data.

621.314.2

1212 CURRENT-LIMITING POWER TRANSFORMERS. H.L.Garbarino and L.J.Stratton.

Elect. Manufng, Vol. 64, No. 4, 116-18 (Oct., 1959).

One method of obtaining current-limiting action is by the use of transformers having high leakage reactances, best achieved by providing low-reluctance, leakage-flux paths in the magnetic circuits. Design of magnetic shunts and determination of dependent transformer parameters by the use of equivalent circuits are outlined.

621.314.2

1213 MODERN TRANSFORMER LAMINATIONS AND DEVELOPMENT TENDENCIES IN TRANSFORMER CORE SHAPING. E.Jezierski.

Przeglad elektrotech., Vol. 35, No. 6, 244-52 (June, 1959). In Polish.

The characteristics of hot- and cold-rolled laminations and the importance of lamination characteristics in transformer production are discussed. Specific characteristics for cold-rolled laminations are given. The design of the shape of the cores with reduced losses is suggested.

M.W.Makowski

621.314.2

1214 PERMITTING HEAVY LOADS ON TRANSFORMERS WITH NATURAL OIL CIRCULATION AND NATURAL AIR COOLING J.Wildeboer.

Smit Meded., Vol.14, No.3, 65-74 (July-Sept., 1959). In Dutch.

Apparent overloads, real overloads and temporary heavy loads on transformers are discussed. The first category are loads exceeding the rated kVA, but complying with rated temperature limits. Real overloads exceed the temperature limits and reduce the useful life of the transformer. Temporary heavy loads can be carried when starting cold. The thermal behaviour of transformers is determined by the measurable quantities: top oil temperature rise, mean temperature rise of the windings, mean temperature rise of the oil surrounding the windings, and the time constants of the transformer. These latter refer to the heat storage capacity of the transformer as a whole and the variation with time of the temperature difference between winding and oil. Possibilities of heavy loads are shown in examples, reference being made to British and U.S. standards for transformers.

G.N.J.Beck

621.314.2

1215 COOLING METHODS FOR TRANSFORMERS AND THEIR APPLICATION. G.A. van Riemsdijk.

Smit Meded., Vol.14, No.3, 77-85 (July-Sept., 1959). In Dutch.

Transformers are divided into three categories according to their insulation : solid, fluid-immersed and gas-immersed, main attention being paid to the last two categories. Transformers with natural oil and natural air cooling are discussed and illustrated with respect to a hermetically sealed 1000/400 V transformer with "sunshades" above the cable-boxes and a 15 kV regulated transformer. Types with natural oil together with combined natural and air blast cooling, with forced oil and forced water cooling, and forced oil and air-blast cooling are discussed. The location and fixing of cooler units and fans for several 25-120 MVA transformers are dealt with. The third category comprises dry-type transformers with natural ventilation, forced ventilation and sealed-in types with inside or outside natural cooling.

G.N.J.Beck

621.314.2

1216 HIGH-VOLTAGE RECTIFIER TRANSFORMER PROBLEMS. T.L.Wilson.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 352-7 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

Transformers used in conjunction with industrial and communications electronic rectifiers (mostly mercury-arc) are particularly liable to failure due to coil movements and due to insulation breakdown, or to a combination of these two causes. Rectifier transformers are unavoidably subject to frequent short-circuits, either produced deliberately as a protective measure or by arc-backs, and the author emphasizes the need for adequate bracing to withstand the forces caused. High electrical stresses may be produced by rapid arc-interruption devices in oscillator circuits particularly if these operate when overload current is flowing in the transformer, or by ion-starvation interruptions in the rectifier itself. Several methods of mitigating these troubles are discussed. M.R.Dickson

621.314.22

1217 SYNTHETIC RESIN INSTRUMENT TRANSFORMERS. A.Imhof.

Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 20, 705-10 (Oct. 11, 1959). In German.

Discussion of the advantages and problems associated with the manufacture, testing and use of instrument transformers totally embedded in synthetic resin. Particular reference is made to the location and assessment of faults by measuring glow discharge voltages : an example is given in detail. Permanent shrinkage and weather resistance are discussed and large units based on novel design considerations are described. H.Norel

POWER CONVERSION

621.314.25 : 621.3.012.8

1218 THE CALCULATION OF CIRCUITS WITH RECTIFIERS AND ACTIVE RESISTANCES. N.N.Kostake.

Elektrichestvo, 1959, No. 5, 17-21 (May). In Russian.

A simple theorem is demonstrated. If the e.m.f. in any branch of a complex rectifier network changes in such a way that the entire state of the network is modified, then restoring the e.m.f. to its original value also restores the original network state. This is equivalent to saying that the networks considered have no hysteresis. Two fairly complicated worked examples are given in which the changes in current distribution in networks containing rectifiers are evaluated. S.C.Dunn

621.314.57

1219 APPLICATIONS OF MUTATORS TO EXTRACTION MACHINES. M.Kuntner.

Bull. Sci. Assoc. Ingen. Montefiore (A.I.M.), Vol. 72, No. 4-5, 293-321 (April-May, 1959). In French.

Explains how a mercury-arc rectifier acts as a mutator, changing from a convertor to an invertor as commutation is retarded by more than 90°. Investigates three ways of improving the power factor — the use of two mutators in series, with cascade grid control, the use of unsymmetrical grid control, or the insertion of auxiliary mutators between the transformer neutral point and the cathodes. The first method is cheapest to install and offers automatic protection of the motor against arc-back. Its use is described on a Koepe pulley extraction machine with two 1800 kW motors taking 2960 A at 640 V each; oscillograms are shown. The operation of the Contiflux system of regulation used on this machine is described in detail; it enables the torque to be varied continuously in both directions without interrupting the motor supply during reversal. E.F.Hansford

621.314.57

1220 APPLICATIONS OF MUTATORS IN THE SPHERE OF ROLLING MILLS. M.Matta.

Bull. Sci. Assoc. Ingen. Montefiore (A.I.M.), Vol. 72, No. 4-5, 323-42 (April-May, 1959). In French.

Describes four methods of connecting mutators to drive and control hot continuous-rolling mills, and explains, with oscillograms, which is most suitable to meet the requirements of various rolling operations. A typical plant layout is described and illustrated. States the advantages of mutators over Ilgner groups for driving hot reversible rolling-mills; three ways of improving the power factor are described but the mains must withstand considerable reactive surges. E.F.Hansford

621.314.63

1221 HOW THE SELENIUM RECTIFIER CAN COMPETE WITH GERMANIUM AND SILICON RECTIFIERS. J.Kroczek.

Elektrotech. Obzor, Vol. 48, No. 10, 507-10 (1959). In Czech.

Compares the properties of these rectifier types with the help of a table and discusses difficulties encountered with Ge rectifiers on overload. In this respect the Se rectifier compares favourably. The losses in a special case using a Ge diode are calculated and the conductivity which would lead to equal losses in a Se rectifier are determined. It is pointed out however that Se rectifiers of the required conductivity are not available. N.Klein

621.314.634

1222 THE INVESTIGATION OF SELENIUM RECTIFIERS BY PULSE EXCITATION. D.N.Nasledov and I.M.Yashukova.

Fiz. tverdogo Tela, Vol. 1, No. 8, 1188-92 (Aug., 1959). In Russian.

Results obtained by pulse excitation do not deviate significantly from the static reverse characteristic. The reverse resistance obeys Zener's law. The intensity of electrical field, capacitance and thickness of barrier layer as functions of reverse voltage were also measured and computed. P.Szekely

621.314.65

1223 THE SIGNIFICANCE OF SAFETY FACTOR IN THE DESIGN AND CONSTRUCTION OF LARGE RECTIFIER INSTALLATIONS. B.Storsand.

Elektrotek. T., Vol. 72, No. 34, 489-95 (Dec. 5, 1959). In Norwegian.

An Oerlikon single-anode rectifier installation for 90 kA, 850 V at Mosjø (Norway) started service in 1958. The single-anode type with constant-burning auxiliary arc is gradually displacing multi-anode types. They occupy less space and arc-back risks are reduced. Short-circuit tests on the equipment showed that direct short-circuit of one anode — corresponding to an arc-back — could take place without interruption of operation. G.N.J.Beck

621.314.653 : 537.52

1224 SIMPLIFIED REPRESENTATIONS ON THE FIRING CHARACTERISTICS OF VIBRATIONAL-IGNITOR TUBES. S.Okanishi and H.Kanamori.

J. Phys. Soc. Japan, Vol. 14, No. 4, 542 (April, 1959).

Describes experiments on the firing characteristics of mercury-pool low-pressure arc tubes (ignitrons). Resistive and inductive loads were studied. Data for firing probabilities are plotted graphically as a function of ignitor current. J.D.Craggs

621.314.653 : 621.039

1225 THE IGNITRON AS A SWITCH IN HIGH-VOLTAGE HEAVY-CURRENT PULSING CIRCUITS. H.de B.Knight, L.Herbert and R.C.Maddison.

Proc. Instn Elect. Engrs, Paper 2947 [Convention on Thermonuclear Processes] publ. April, 1959 (Vol. 106A, 131-7, 142-7).

Republication, with discussion, of the paper already abstracted in Abstr. 2677 (1959).

POWER TRANSMISSION
OVERHEAD LINES . CABLES

621.315.051.024

1226 D.C. POWER TRANSMISSION. I. HISTORICAL DEVELOPMENT. E.O.Taylor.

Elect. J., Vol. 163, No. 23, 1227-31 (Dec. 4, 1959).

The article is the first of a series which summarizes a course of lectures recently delivered at the Heriot-Watt College, Edinburgh. The chief technical factors that limit the amount of power that can be transmitted over a three-phase line are discussed and early d.c. systems and convertor developments are described. Several experimental d.c. transmission installations using single-anode or multi-anode mercury-arc convertors are briefly outlined and commercial installations now in operation and under construction are briefly mentioned. Central Electricity Generating Board Digest

621.315.051.024

1227 POWER TRANSMISSION WITH HIGH-VOLTAGE DIRECT CURRENT. U.Lamm.
Tekn. T., Vol. 90, No. 1, 1-6 (Jan. 2, 1960). In Swedish.

A review of progress since the installation in 1954 of the Swedish mainland–Gothland 20 MW 120 kV d.c. submarine cable link. Research is in progress at the Trollhättan laboratories on rectifiers for higher outputs — 125 kV is now possible and 150 kV in the near future: anode currents also will be increased. Mercury rectifiers, it is thought, are unlikely to be displaced by semiconductor types for the highest powers. The layout and design of convertor substations is discussed with reference to a station using four series-coupled rectifier sets on the d.c. side. Costs of h.v.d.c. transmission are plotted against distance and compared with corresponding figures for a.c. transmission. G.N.J.Beck

621.315.1

1228 A PRIMER ON LOSS FORMULAS. D.C.Harker.
Trans Amer. Inst. Elect. Engrs III, Vol.77, 1434-6 (1958) = Pwr Apparatus Syst., No.40 (Feb., 1959).

The purpose of this short paper is to provide a simple, direct approach to loss formulae so that these principles may be more readily understood. The significance of the constants, particularly the B constants, is explained. A.P.Wilmshurst

621.315.1

1229 WAVE PROPAGATION ALONG UNBALANCED HIGH-VOLTAGE TRANSMISSION LINES. G.E.Adams.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 639-47 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

The simplifications are enumerated from which conventional solutions of problems of wave propagation proceed. A novel mathematical analysis of this problem is presented which permits single-phase and pulse-type excitations to be considered, accepts unbalanced conditions in multi-conductor systems, includes the generation of surges by space-charge currents, and contains provisions for evaluating the total field strengths near o.h. line conductors. A variety of the constants is plotted in graphical form and these can be applied to solutions of numerical problems. Good agreement is shown to exist between theoretical and test results reported in a companion paper (Abstr. 7615 of 1959). R.H.Golde

621.315.17

1230 FAULT LOCATION ON OVERHEAD LINES. J.d'Adler-Racz.
Bull. Sci. Assoc. Ingen. Montefiore (A.I.M.), Vol. 72, No. 9, 535-44, (Sept., 1959). In French.

A general account is given of the nature of faults met in practice and of available methods for their location. It is concluded that the most generally useful approaches for locating permanent or intermittent faults are the radar method (distance measurement by echo-arrival time), or high-tension d.c. plus shock waves, respectively. A.Reiss

621.315.17

1231 NOTES ON THE ERECTION OF THE CONDUCTORS IN ELECTRIC LINES. E.M.Ibáñez.
Dyna, Vol. 34, No. 12, 907-24 (Dec., 1959). In Spanish.

A detailed illustrated description of the various methods for erecting these conductors. One of the main considerations is to avoid damaging the surface of the conductors when drawing them along the ground. The equipment required, communication facilities and techniques for regulating the wires are described in some detail. R.Neumann

621.315.17

1232 120 kV SUPPLY ON LOLLAND-FALSTER (DENMARK). F.Nielsen.
Elektroteknikeren, Vol. 55, No. 24, 428-9 (Dec. 22, 1959). In Danish.

Describes the replacement of the two old 50 kV lines linking the islands of Lolland and Falster with the mainland by a 120 kV line with 100 MW carrying capacity. The line is carried on wooden towers and the sea crossings are made by 120 kV submarine cables. The conversion of the existing 50 kV transformer substation at Rasted to 120 kV operation is discussed. G.N.J.Beck

621.315.17

1233 RELATIONSHIP BETWEEN CORONA AND RADIO NOISE ON TRANSMISSION LINES. II. CONDUCTOR AND INSULATOR CORONA. T.W.Liao and J.J.LaForest.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 706-12 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

For Pt I see Abstr. 572 (1958). Continued study of the relation between corona pulses and radio noise, now on short samples of smooth conductors (diameter 0.25 to 1 in, bundles up to 3 conductors) suspended in the middle of a cylinder 8 ft diameter, and on strings of insulators, introducing an artificial corona source at one of them. The noise depends very much on the position of the fault in the string. Some measurements with millimicrosecond pulses were made on a 345 kV line. A chart given in Pt 1 for the determination of radio noise from height and repetition rate of pulses proved to be valid for the new tests as well. H.R.J.Klewe

621.315.17

1234 RATIONALIZATION OF ELECTRICAL CLEARANCES FOR APPLICATIONS AT EXTRA-HIGH VOLTAGES, 230 kV TO 460/500 kV. P.L.Bellaschi.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 736-43 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

The increasing use of very high voltage provides the economic urge for rationalization in station and line design. This paper develops the basic approach that switching surges in combination with the working voltage are primary factors in determining clearance requirements. Minimum phase-to-ground and phase-to-phase clearances are derived for stations up to 500 kV; the results are discussed and compared with current values and practice. The general conclusion is that further research on switching surges will enable clearances to be substantially reduced. A.P.Wilmshurst

621.315.17 : 621.313.322

A POSSIBLE MEANS OF INCREASING THE POWER WHICH CAN BE CARRIED BY A TRANSMISSION LINE. See Abstr. 1198

621.315.174

1235 AEOLIAN VIBRATION TESTS ON THE 345 kV MUSKINGUM–TIDD LINE.
E.S.Zobel, A.N.Shealy, F.W.DeMoney and R.R.Ruegemer.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 852-64 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

On their 345 kV system the American Electric Power Co. use single conductors of 1.75 in. dia. but on this line 3 test sections each 8 miles long were erected with twin conductors of 1.108 in. dia. This paper deals with a portion of the study of vibration on twin conductors. Test methods are described in detail. Results have not been completely analysed but some general conclusions are drawn. Vibration of horizontally-spaced twin conductors without spacers was found to be about one third of that of single conductors and with spacers about one fifth. A.P.Wilmshurst

621.315.2

1236 CABLES IN MINE SUBSIDENCE AREAS. L.Geiling and H.Riso.
Elektrizitätswirtschaft, Vol. 58, No. 8, 249-52 (April 20, 1959). In German.

Describes research by Siemens-Schuckertwerke on types of cable and methods of laying designed to withstand the effects of ground movement. The nature and causes of such movements and their effects on cables are first discussed. Preventive measures must be both technically sound and not too costly. Desirable features of cables, joints and trenches are listed. A.P.Wilmshurst

621.315.2 : 614.825

GNAWING BEHAVIOUR OF THE RAT, WITH REFERENCE TO ATTACK ON PLASTIC CABLE. See Abstr. 1125

621.315.21

1237 THE BEHAVIOUR OF METALLIC SCREENS ON CABLES HAVING SOLID INSULATION WHEN SUBJECTED TO SHORT-CIRCUIT CURRENTS. R.Arrighi.
Bull. Soc. Franc. Elect., Vol. 9, 649-65 (Nov., 1959). In French.

Copper or aluminium tape screens used on cables having thermoplastic or synthetic rubber insulation are considered, and a theoretical and experimental investigation of their electrical and thermal properties when carrying the cable short-circuit current is carried out. Electrically, it is established that the contact resistance between overlapping turns of the screen becomes constant at a definite inter-turn voltage, and also that the direction of current flow in the screen is a function of the inter-turn resistance. Thermally, it is shown that the transient heating of the screen is not adiabatic, significant

heat losses occurring even during the period of short-circuit. Equations are given for calculating voltage drop and temperature rise in the screen. M.R.Dickson

621.315.21

1238 THE CURRENT LOADING OF POWER CABLES WITH PAPER INSULATION. J.Bekink.

Electrotechniek, Vol. 37, No. 25, 583-91 (Dec. 10, 1959). In Dutch.

A detailed account of revision work on the Netherlands standard N1279. Current loadings are given for cables in soil between 5° and 25°C. Cables up to 3000V can be allowed to run with an insulation temperature of 50°C and for higher-voltage cables, 43°C is permissible. Rules of calculation are given for determining the permissible current loadings in the case of heating by neighbouring cables and the permissible currents for non-buried paper-insulated cables. G.N.J.Beck

621.315.21 : 621.315.616

1239 EXPERIENCE WITH PLASTIC-INSULATED CABLES AND WIRES UP TO 1 kV. H.Henze.

Elektrotech. Z. (E.T.Z.)B, Vol. 11, No. 10, 416-19 (Oct. 21, 1959). In German.

A summary of tests which have shown p.v.c. to be a satisfactory insulating material over temperatures ranging from +3° C to +300° C at the conductor. V.G.Welsby

621.315.211.9 : 621.316.99

GROUNDING AND CATHODIC PROTECTION OF PIPES FOR PIPE-TYPE CABLES. See Abstr. 705

621.315.213.1

1240 NEW INSULATED ALUMINIUM CABLE. Elect. J., Vol. 164, No. 2, 90-1 (Jan. 8, 1960).

Describes a new design of cable, known as "Solidal", consisting essentially of sector-shaped cores of soft aluminium insulated by an extruded p.v.c. coating. The conductors are laid up with a right-hand lay and lapped with clear p.v.c. tape to a thickness of 0.04 in. Outside this is a single layer of rectangular, hard aluminium wires applied with a left-hand lay, their cross-sectional area being equal to that of one of the cores. These wires give effective protection to the cores, provide a low-resistance screen to prevent dangerous electrical leakage in the event of severe damage, and are also designed to serve as the neutral conductor. Over the neutral–armour wires may be laid a right-hand-lay tape of 0.005 in. aluminium foil to equalize current distribution in the wires. In some cases a barium-chromate linen tape may be wound over the current-equalizing tape to give chemical protection to the wires against attack by soil electrolyte in the event of the outer becoming damaged during installation. Overall is an extruded sheath of black p.v.c. The thickness of both insulating and sheathing plastic is in accordance with normal design standards for 11 kV cables. Experimental data and curves comparing Solidal with copper conductor cables are included. H.A.Miller

621.315.23

1241 THE DESIGN AND MANUFACTURE OF DIRECT BURIAL WIRE. J.L.Robb and W.L.Roberts.

Elect. Engng, Vol. 78, No. 12, 1178-82 (Dec., 1959).

A discussion of the design and manufacturing techniques of a direct burial wire that compares favourably in cost with open-wire construction in areas where high-speed wire ploughs can be used.

621.315.23

1242 THE EFFECTS OF SHORT-CIRCUITS IN UNDERGROUND POWER CABLES. A.Morello.

Elettrotecnica, Vol. 65, No. 12, 814-27 (Dec. 10, 1959). In Italian.

The effects of faults on underground cables vary considerably, dependent on whether they are close to the generator terminals or out on the network with appreciable impedance between them and the power source. A mathematical account is given of the thermal effects for both conditions and calculations included to show the short-circuit forces acting on the conductors of the cable. Some numerical examples are worked and it is concluded that in general cables conventionally rated for normal service have a substantial factor of safety against the effects of fault currents. M.Rathbone

621.315.232

1243 CABLE CREEPAGE. R.H.Harris.

Post Off. elect. Engrs' J, Vol. 52, Pt 2, 115-21 (July, 1959).

Surveys the whole problem of cable creepage and describes the investigations that have been carried out by the Post Office and other administrations into the causes of cable creepage and the conditions under which it occurs. A description is given of the various anti-creepage devices that have been developed and assessments are made of their performance. Details are also given of some unusual cases of cable creepage.

621.315.24

1244 EXPERIMENTS IN AERIAL-CABLE CONSTRUCTION [FOR TELEPHONE SERVICES]. J.Bluring and H.F.Snow.

Post Off. elect. Engrs' J, Vol. 52, Pt 1, 47-54 (April, 1959).

Describes several new methods of aerial-cable construction which are at present being used or are on extensive field trial. These include self-supporting aerial cables of several different types and aerial cable that is lashed to a suspension wire in the factory.

621.315.28

1245 138 kV UNDERSEA CABLE ACROSS GEORGIA STRAIT. T.Ingledow.

Engng J., Vol. 42, No. 10, 96-102 (Oct., 1959).

The link between the lower mainland of British Columbia and Vancouver Island consists of 7 single-core, gas-filled cables, comprising two 120 MVA circuits and one spare cable. The cables for the Strait crossing were made in continuous lengths of over 14 miles, the methods of manufacture, laying and commissioning being of great technical interest. A.P.Wilmshurst

621.315.28

1246 MORE ABOUT NONARMORED SUBMARINE CABLE. C.S.Lawton.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 367-9 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

A report on the successful recovery of an experimental length of cable laid in 1951 at a depth of 1250 fathoms. The condition of the recovered cable was generally satisfactory and supports the theory that, in deep water, the use of expensive armour wires on the outside of a cable is unnecessary. V.G.Welsby

INSULATORS
SUPPORTS . CONNECTIONS

(See also Insulating Materials)

621.315.62

1247 INVESTIGATION OF BREAKDOWN IN VACUUM. E.S.Borovik and B.P.Batrakov.

Zh. tekh. Fiz., Vol. 28, No. 9, 1971-80 (1958). In Russian.

Surface breakdown in vacuum takes place along narrow channels on the surface of the insulator. Of a dozen insulators tested, Plexiglas and Viniplast had the greatest strength. In breakdown of vacuum gaps, pre-breakdown electron current is observed. Increasing the degree of degassing of the electrodes does not increase the electric strength of the vacuum gap. The breakdown of an insulator and that of a vacuum gap are not dependent on pressure in the range 10^{-4} to 10^{-6} mm Hg. Z.Krasucki

621.315.62 : 621.315.616.96

1248 EPOXY-RESIN INSULATORS. BEHAVIOUR TOWARDS POLLUTION AND HUMIDITY. P.Lafont.

Bull. Soc. Franc. Elect., Vol. 9, 541-3 (Sept., 1959). In French.

Unloaded epoxy-resin insulators are affected by corona which occurs under certain conditions of pollution and dampness. The addition of mineral fillers reduces this sensitivity, even under severe atmospheric conditions. I.D.L.Ball

621.315.625.4

1249 A NEW FORM OF TERMINATION FOR H.V. LINES UP TO 30 kV. R.Heller and L.Rossetti.

Österr. Z. ElektWirtsch. (Ö.Z.E.), Vol. 12, No. 12, 587-9 (Dec., 1959). In German.

A short description of single- and double-insulator tension sets using rod insulators. The cap fittings are specially designed for cheapness and simplicity. Arcing horns can easily be fitted. A.P.Wilmshurst

621.315.668.1 : 621.365.55

1250 THE STERILIZATION OF INSECT-INFESTED WOOD BY HIGH-FREQUENCY HEATING.

A.M.Thomas and M.G.White.
Wood, Vol. 24, No. 10, 407-10 (Oct.); No. 11, 449-51 (Nov.); No. 12, 487-8 (Dec., 1959).

Utilizing the principles of dielectric heating, the high-frequency fields (76 and 37 Mc/s) are used to sterilize wood infested with larvae of Lyctus powder-post beetles. The field strengths, times of exposure and temperatures attained by the wood, to give complete sterilization, have been measured. It is shown that wood can be sterilized by both h.f. uniform fields and stray-field heating, in which electrodes are applied to one surface only. The expectation that the wood temperature effective for sterilization would be lower with the h.f. than with conventional kiln heating methods, owing to the existence of the h.f. differential heating effect, is not realized in practice. The reason is that appreciable differential heating effects are obtained only with relatively short-period exposures and, under these conditions, the lethal temperatures are higher. Nevertheless it is concluded that the h.f. method is valuable for the treatment of timber in situ, in cases where kiln heating or chemical treatment is either impracticable or inconvenient, and, particularly, for treating panelling in situ by means of the stray-field heating technique. Some information on the rating and cost of equipment is included, and reference is made to considerations which impose limitations on the size of timber which can be treated successfully in practice.

621.315.668.2

1251 STEEL TOWERS FOR THE E.H.V. SYSTEM OF THE B.P.A. F.W.Farr.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 770-9 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

In the past the Bonneville Power Administration has made extensive use of wood pole lines but recent experience with steel towers has been very satisfactory. For future 345 kV lines, of which some 3000 circuit miles may be required a new range of single-circuit and double-circuit steel towers is being developed. These are slimmer than earlier designs and have a narrower base. Overhead earth wires are omitted except at the run-in to stations; single conductors are used. The wide variety of climatic conditions and terrain, including heavily wooded mountainous country, necessitates a number of different types. Dished-plate footings will largely replace conventional grillages. A.P.Wilmshurst

621.315.68

1252 ELECTRICAL COUPLING BY ALUMINIUM AND COPPER CONTACTS. P.Plante.
Bull. Soc. Franc. Elect., Vol. 9, 504-16 (Sept., 1959). In French.

Contacts in the form of bars, especially if made of aluminium, show a progressive deterioration under the action of the current. With a view to reducing this deterioration, the effects of pressure and of various prior treatments of the metal surface were examined, and are here described. P.M.Davidson

621.315.682

1253 PREPARATION OF ALUMINUM CONDUCTORS FOR STABLE ELECTRICAL CONNECTIONS.

M.R.Monashkin.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 729-32 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

Describes the measurement of aluminium contact resistances between strips of aluminium, receiving different scratch brushing and compound treatments, under varying pressures applied by means of a hydraulic press. The difference in resistance between scratch brushing through the compound and compound applied after dry scratch brushing immediately before assembly is negligible. The increase in resistance due to oxide build up is not significant up to 5 hours on EC aluminium surfaces. A heat cycle test, which is described, indicated that a one-bolt parallel groove clamp, using compound, up to 10 minutes after dry scratch brushing, will perform satisfactorily. W.A.Walker

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DISTRIBUTION . INSTALLATIONS

621.316.1

1254 THE PRODUCTION OF REACTIVE POWER BY MEANS OF CAPACITORS IN THE DISTRIBUTION NETWORK.

P.Gaussens; Hennebert; J.Grattery.
Bull. Soc. Franc. Elect., Vol. 9, 686-93, 693-5, 695-7 (Nov., 1959). In French.

Discusses the various methods of improving the power factor of a distribution system with particular reference to the use of banks of capacitors installed at the consumer's end. Curves are reproduced showing that for a long distribution line carrying up to 6 MVAr it is more economical to generate the reactive power at the source; between 6 - 23 MVAr batteries of capacitors at the h.v. - m.v. transformer station are recommended, above this figure best results require capacitors distributed along the line. These conclusions are reached by plotting the capital cost of capacitor installations against the cost of transmitting large quantities of reactive kVA. D.R.Way

621.316.1

1255 PREFABRICATED BANKS [OF CAPACITORS] FOR LOW TENSION NETWORKS.

A.Blancpain; G.Lacan.
Bull. Soc. Franc. Elect., Vol. 9, 698-701, 701-4, (Nov., 1959). In French.

The theoretical considerations governing the design of batteries of capacitors for voltage regulation purposes on low tension distribution lines, particularly in rural areas, are covered in preceding abstract. In this article a description is given of the necessary switchgear, fuses, and voltage-sensitive relays which are accommodated in a metal cabinet designed for mounting on the post which carries the low-voltage lines. Particular care has been taken to ensure that the cabinet, although of simple design, is completely weatherproof. D.R.Way

621.316.1

1256 DETERMINATION OF THE ECONOMIC EFFICIENCY OF JOINING NEW AREAS TO A LARGE ENERGY SYSTEM. D.S.Stepanov.
Elektrichestvo, 1959, No. 8, 14-21 (Aug.). In Russian.

Presents a detailed mathematical analysis of the relative economics of using a few large stations or a greater number of low- or medium-power stations to cope both with the increasing electrification of industry in 1959-65 and with the compulsory electrification of all collective and state farms, workers' settlements, etc. D.E.Brown

621.316.1 : 681.142

1257 PROGRAMMING DIGITAL COMPUTERS FOR CALCULATIONS OF ECONOMICAL LOAD DISTRIBUTION IN POWER SYSTEMS. N.A.Kachanova and V.V.Umed'yan.
Elektrichestvo, 1959, No.9, 1-4 (Sept.). In Russian.

Presents a method of successive approximations for the solution of the non-linear load distribution equations, where the hourly fuel expenditure for the power system as a whole is minimized. The preliminary calculation of the distribution coefficients in the loss equation is also described. V.V.Zakharov

621.316.1

1258 THE NECESSITY FOR TAKING NETWORK LOSSES INTO ACCOUNT WHEN PLANNING THE DISTRIBUTION OF ACTIVE POWER IN A SYSTEM. B.M.Sin'kov.
Elektrichestvo, 1959, No. 9, 20-5 (Sept.). In Russian.

By an approximate calculation, referred to a simple network, it is shown that by neglecting to take into full account the losses in the line errors may be made in the determination of fuel consumption in the various power stations feeding the system. Graphs produced show the influence upon the additional fuel consumption of the network losses due to the load in the system and of its distribution, as well as the variation of this additional consumption with the variation of losses in the line. A.Karlsbad

621.316.1

1259 GRAPHICAL METHOD FOR THE CALCULATION OF NETWORKS. P.Steglich.
Elektrotech. Z. (E.T.Z.) A, Vol.80, No.11, 331-5 (June 1, 1959). In German.

See Abstr. 4972 of 1959. The method is based on expressing both sides of the equations found (and to be evaluated) as fractions

which are then represented as tan of a certain angle. The construction is derived for various connections, e.g. series, parallel, series-parallel and meshed connections. Hints are given for simplifications and a numerical example shows the application to a network consisting of several generators, transformers, outside supply and busbars. R.Neumann

621.316.11

1260 DISTRIBUTION TRANSFORMER LOAD MANAGEMENT. P.G.Brittain.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 665-8(1959) = Pwr Apparatus Syst., No. 43, (Aug., 1959).

Describes the methods used by the Dallas Power and Light Co. to calculate the individual maximum kVa loading of each distribution transformer in an urban system from the readings of consumers' kilowatt-hour meters. The average relationships between an individual consumer's kW-hr. consumption and kVa demand were established by tests on selected transformers in the network. M.R.Dickson

621.316.11 : 681.142

1261 DETERMINATION OF DISTRIBUTION TRANSFORMER LOADING FROM KILOWATT-HOUR CONSUMPTION BY ELECTRONIC COMPUTATION. C.F.Mitchell and J.A.Hughes.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 896-904 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

An application of electronic computers to the assessment of distribution transformer loadings from the readings of individual consumers' meters and a knowledge of average load and diversity factors established by sampling tests (see also preceding abstract). M.R.Dickson

621.316.1 : 681.142

1262 A COMPUTER FOR ECONOMIC LOAD DISTRIBUTION. O.R.Terno, O.M.Pikkov and Kh.M.Lelumeés.

Elektrichestvo, 1959, No. 9, 5-8 (Sept.). In Russian.

Gives the organization and details of an electronic analogue computer for the solution of the load distribution equations in a specific power system. The influence of nonlinear fuel consumption and line losses is particularly considered, and a transistorized simulator for the relative incremental consumption is described. V.V.Zakharov

621.316.11

1263 SMALL TOWN DISTRIBUTION IN U.S.A. R.W.Ryder.

Elect. Times, Vol. 136, 573-6 (Nov. 19, 1959).

Following a general survey of the overhead and underground distribution systems used in American "outside areas" the methods used for carrying out voltage drop studies and applying corrective action to the system by installing boosters and voltage regulators are described. Other features discussed are: (1) the wide use of automatic circuit reclosers; (2) shunt capacitors for power factor improvement; (3) direct feeder links to load centres in built-up areas; and (4) the future planning of systems. G.V.Hargreaves

621.316.13

1264 AN OVERVOLTAGE PHENOMENON. M.Talvitie.

Kraft o. Ljus, Vol.32, No.11, 263-6 (Nov. 1959). In Swedish.

On a Finnish network a peculiar overvoltage was observed. On the l.v. side of a distribution transformer connected to short 20 kV branch lines, 300-350 V phase voltages were experienced. The branch lines were protected with 20 kV fuses, one fuse in each line burning out. At the terminals a glow discharge took place and a frying noise was heard, indicating that an exceptionally high voltage had occurred across them. The fault conditions were examined theoretically and detailed measurements were made on 8.7 and 57 km lines, showing that the overvoltages were dependent on the ratio of the capacitances of the h.v. lines and the transformer's magnetization reactances. G.N.J.Beck

621.316.17 : 621.315.673.3

1265 SOCKET-OUTLETS IN PUBLIC AUTHORITY HOUSING. J.Crisp and K.J.Noble.

Elect. Times, Vol. 136, 533-7 (Nov. 12, 1959).

A report of an investigation into the provision of socket-outlets in 120 houses randomly selected from 4 housing estates belonging to a local authority and a development corporation. The socket-outlet allocation and the numbers and types of appliances used by tenants in various rooms are tabulated and discussed, and comparative costs of socket-outlet provision are summarized. The results of the investigation suggest that the minimum scale of socket-outlet provision for houses of the type studied should be 15. Socket-outlets should be so placed that flexible cable to the likely appliances will, for the main part, follow walls in order to avoid circulation areas. In general, it is recommended that in some small rooms where one socket-outlet will suffice it is preferable to place it near the window, and in rooms where two socket-outlets are adequate these are best placed near diagonally opposite corners, the diagonal chosen depending on the extent to which the room plan is likely to influence the placing of the furniture and equipment. The exact positions should have regard to the proximity of other socket-outlets in neighbouring rooms in order that economic advantage can be taken of reductions in wiring, wall chases, etc. Plans and isometric drawings are included. H.A.Miller

621.316.176

1266 THE DEVELOPMENT OF THE PHILIPS WORKS AT EINDHOVEN DURING RECENT YEARS. V. SOME ASPECTS OF THE ELECTRICITY SUPPLY. J.W.M.van Rooy.

Ingenieur, Vol. 71, No. 52, B238-B244 (Dec. 25, 1959). In Dutch.

Consumption at the works rose from 45 GWh in 1938 to 170 GWh in 1958. Specific consumption (in GWh/man/year) rose from 2.9 in 1938 to 5 in 1958, this being an index of the rise in productivity. The layout is shown of the main 10 kV distribution system which is in the form of T-complex. A 150 kV cable from the PNEM power station feeds a main 150/10 kV transformer substation, located in a separate building. This in turn feeds a 10 kV busbar connecting with 10 kV/380-220 V switching and transformer substations in the various factory buildings. The l.v. power supply is of interest, as the busbars are installed beneath the factory floors. G.N.J.Beck

621.316.35

1267 ALUMINUM BUS FOR SHIPBOARD APPLICATION. G.J.Thompson and S.H.Behr.

Trans Amer. Inst. Elect. Engrs II, Vol. 78 239-47 (1959) = Applic. and Industr.,No. 44 (Sept., 1959).

Investigations were made into two grades of aluminium conductor to determine the variations in joint resistance for different methods of surface preparation. It is concluded that for marine use a hard aluminium alloy, silver-plated overall and coated with joint compound before assembly will make a satisfactory bus bar arrangement. An account of the behaviour of busbar under short circuit, corrosion, vibration and shock conditions is included. M.Rathbone

SWITCHGEAR

621.316.5 : 621.315.616.9

1268 THE USE OF PLASTICS IN HIGH VOLTAGE SWITCHGEAR. W.Horn and W.Weigelt.

Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 20, 698-704 (Oct. 11, 1959). In German.

An account of recent developments in the design of h.v. switchgear using various new synthetic materials with or without fillers for insulators, bushings, mechanical links, arcing chambers, etc. H.Norel

621.316.5 : 621.315.616.9

1269 INSULATION TECHNIQUES FOR HIGH-VOLTAGE SWITCHGEAR USING PLASTICS. K.Getschmann and G.Meiners.

Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 20, 711-18 (Oct. 11, 1959). In German.

Account of recent developments in the field of metal-clad substation equipment with particular reference to those using synthetic resin filling. The prospects of this type of equipment and its advantages in respect of space requirements etc. are discussed and methods of connecting it to h.v. transmission lines are touched upon. H.Norel

621.316.5 : 621.387

1270 LOW-INDUCTANCE SWITCHING USING PARALLEL SPARK-GAPS. R.A.Fitch and N.R.McCormick.

Proc. Instn Elect. Engrs, Paper 3108 [Convention on Thermonuclear

Processes] Vol. 106A, Suppl. No. 2, 117-30, 142-7 (1959).

It is suggested that the requirement of a capacitor discharge bank for a fast low-impedance switch can be met by using many spark gaps in parallel. Three types of triggered spark-gap are described and their operation in a parallel system is analysed. Some results of experiments on these gaps are given. Finally, a report is given of the construction and performance of the 45kJ 200 spark-gap bank currently in use at the Atomic Weapons Research Establishment. It is concluded that the system is capable of extension to much larger banks.

621.316.57 : 621.315.616.96

1271 USE OF EPOXY RESINS IN HIGH VOLTAGE CIRCUIT BREAKING EQUIPMENT. V.Delevoy.

Bull. Soc. Franc. Elect., Vol. 9, 556-60 (Sept., 1959). In French.

To indicate the advantages of using thermosetting plastics in control gear the following examples are discussed and the differences between the old and new designs are illustrated: (1) a switch for 20 kV use; (2) a de-ion circuit-breaker with magnetic blow out, 6 kV, 250 MVA; and (3) a low oil content circuit-breaker for 70 kV use. The new designs occupy considerably less space than the older ones and safety and performance are increased with improvement in appearance. The number of parts required is also considerably reduced by use of mouldings or castings. A.P.Paton

621.316.57 : 621.315.616.96

1272 USE OF SYNTHETIC RESINS, IN THE CONSTRUCTION OF HIGH VOLTAGE CIRCUIT-BREAKERS. F.Viale.

Bull. Soc. Franc. Elect., Vol. 9, 551-5 (Sept., 1959). In French.

Describes with illustrations the use of fibre-glass epoxy-resin tubes in the construction of the Alsthom HJO 313 circuit-breaker with particulars of the arcing chamber and control mechanism. Use of this material enables the sizes of the arcing chamber and contact rods to be materially reduced but parts exposed to weather have to be porcelain clad to avoid deterioration. The behaviour of material made of silica-epoxy-resin exposed to the weather is discussed and illustrations showing damage suffered are included. A.P.Paton

621.316.57

1273 CIRCUIT BREAKER SPECIFICATION AND ASYMMETRICAL RUPTURING CAPACITY. S.B.Toniolo.

Elettrotecnica, Vol. 46, No. 12, 858-9 (Dec. 10, 1959). In Italian.

If a standardized wave shape is assumed, the performance of a circuit-breaker may be completely specified by stating its symmetrical rupturing capacity. In practice however, current decrement and other factors are largely influenced by the configuration of the network and the point in the cycle at which the circuit-breaker contacts part. It is suggested that more useful circuit-breaker specifications will be obtained if separate requirements are laid down for the symmetrical and asymmetrical rupturing capacity and for the making capacity. M.Rathbone

621.316.57 : 621.315.616.96

DIELECTRIC ENDURANCE TESTS ON SYNTHETIC RESIN CONTAINERS. RESULTS OBTAINED. FUTURE PROSPECTS. See Abstr. 1341

621.316.57.064.25

1274 FIELD TESTS ON A 345 kV HIGH-CAPACITY OIL CIRCUIT BREAKER AT PHILIP SPORN POWER PLANT.

O.Naef, J.D.M.Phelps, W.R.Wilson and A.L.Streater.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 829-43 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

A fairly detailed account of tests made on a General Electric type FGK oil circuit-breaker rated at 25 000 MVA to check performance on clearing fault currents and interrupting charging current of open-circuited lines. Transient restriking and recovery voltages were measured under a variety of conditions shown in tables and in oscillograms. The mode of operation of the circuit-breaker and the test procedure used are briefly described with notes on the analysis of oscillograms. A.P.Paton

621.316.57.064.46

1275 A NEW CONCEPT IN POWER CIRCUIT-BREAKER DESIGN UTILIZING SF_6.

R.E.Friedrich and R.N.Yeckley.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 695-706 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

Describes the design of a 230 kV 15 000 MVA circuit-breaker to form another unit in a complete range of circuit-breakers using SF_6 gas as the interrupting medium. It comprises 3 cylindrical steel tanks each containing SF_6 gas at 30 lb/in^2 and a multibreak interrupter. The design of the interrupters is illustrated in some detail and they are closed pneumatically and opened by springs. Oscillograms and tables outline performance on extensive tests made in the laboratory. A.P.Paton

REGULATION

621.316.7

1276 ARE NONLINEAR ELEMENTS IN REGULATING LOOPS DESIRABLE OR UNDESIRABLE? A.Leonhard.

Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 21, 489-95 (Nov. 1, 1959). In German.

Because control systems nearly always have nonlinear elements present, it is argued that nonlinear control and shaping elements are often necessary for good design. The difficulty of calculating the response and therefore the best values for the design parameters is noted. Examples are considered where the solution to simple nonlinear control systems with either linear or nonlinear shaping favour the latter. Some diagrams illustrate the largely non-theoretical but well argued discussion. K.C.Garner

621.316.7

1277 INTRODUCTION TO REGULATION TECHNIQUE WITH THE APPLICATION OF FUNCTION TRANSFORMATIONS. V.Kussl.

Elektrotech. u. Machinenbau (E.u.M.), Vol. 76, No. 21, 495-510 (Nov. 1, 1959). In German.

Deals with the basic principles of control systems, with simple examples. Simple introduction to the Laplace transformation is followed by a discussion on proportional + integral + derivative controllers. Tables and diagrams of transform pairs and network response curves are included. K.C.Garner

621.316.718

1278 INVESTIGATIONS INTO WARD LEONARD REGULATION BY MEANS OF AN ANALOGUE DEVICE. H.Bühler.

Bull. Assoc. Suisse Elect., Vol.50, No.22, 1062-8 (Oct. 24, 1959). In German.

The fundamental equations of each part of the circuit are developed and analogues built up. These are then combined into one device for the whole circuit. Armature reaction is taken into account and its effect on the dynamic behaviour considered. A numerical example is included. R.G.Jakeman

621.316.718

1279 ON SHOCKS IN MECHANISMS WITH IMPULSE REGULATED MOTOR SPEED. L.L.Rotkop.

Elektrichestvo, 1959, No. 8, 52-3 (Aug.). In Russian.

It is shown that when using impulse regulation of motor speed, care must be taken to consider the load on the motor and the transmission. A system which would appear to be quite satisfactory may rapidly destroy the machinery due to the effect of the load inertia being transmitted through the drive and shocks given to the transmission. T.Horrocks

621.316.718.5

1280 CURRENT-CONTROLLED D.-C. MOTOR DRIVE. E.H.Dinger.

Elect. Manufng, Vol.64, No.2, 78-84 (Aug., 1959).

An analysis of the functioning principles of a versatile d.c. motor drive employing armature-and field-current control by thyatrons and ignitrons. Advantages of the system, its operating characteristics, and application data for particular drive requirements are presented.

621.316.718.5

1281 ELECTRICAL GOVERNORS FOR HYDRAULIC TURBINES. I. THE ERELSTAT ELECTRIC GOVERNOR. A.Germond.

Rev. gen. Elect., Vol. 68, No. 10, 565-70 (Oct., 1959). In French.

The development of the purely electric governor is summarized. Guiding design principles are enumerated, especially as regards the use of static apparatus and the absence of rubbing contacts. The action of the Erelstat electric governor, which is mainly electronic, is described in detail and practical results are given. R.G.Jakeman

621.316.718.5

1282 ELECTRICAL GOVERNORS FOR HYDRAULIC TURBINES. II. THE RIVA ELECTRIC GOVERNOR.

W.Wysocki.

Rev. gen. Elect., Vol. 68, No. 10, 578-90 (Oct., 1959). In French.

A description of the Riva electric governor, which is equipped exclusively with electromagnetic apparatus, especially transductors, and has no rubbing contacts. The action is explained and test results are given. R.G.Jakeman

621.316.718.5

1283 ELECTRICAL GOVERNORS FOR HYDRAULIC TURBINES. III. QUALITY CRITERIA AND TESTS FOR GOVERNORS. B.Favez.

Rev. gen. Elect., Vol. 68, No. 10, 578-90 (Oct., 1959). In French.

Criteria for the efficacy of the governors are discussed and a study is made of each separate element in the chain of regulation. From this the behaviour of the complete assembly can be deduced. Detailed test results are given for both the Erelstat and Riva governors. A bibliography is added. R.G.Jakeman

621.316.719 : 621.318.2 : 538.1

1284 STRONG EDDY-CURRENT APPLICATIONS OF PERMANENT MAGNETS. K.Tendeloo.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 236S-237S (April, 1959).

Small eddy-current brakes for kWh meters have a practically linear torque–speed characteristic, because the induced current increases proportionally to the low relative speed between eddy-current disk and magnetic poles. In bigger designs a considerable reaction of the induced-current field shifts the eddy-current paths in the direction of movement, so that the electrodynamic force between current and magnetic poles deviates from the linear relation, reaches a maximum at a critical speed, and decreases asymptotically to zero at infinite speed, whereas the dissipated power becomes a maximum. Some investigations were made into the behavior of permanent magnets with a water-cooled setup with p.m. rotor and an air-cooled device with p.m. stator, both of cylindrical shape with 11.8 in. effective diameter and an axial length of 5.5 in. and 6 in., respectively. Maximum torques of 410 ft lb and 304 ft lb were obtained. Pole pieces may sometimes increase the static flux, but do not always improve the dynamic behaviour. The ideal solution might be obtained with a high-induction magnet without pole pieces, but the induction in available materials is limited by the demagnetizing effect on the free pole top. Possible applications could be found in a retarder for heavy trucks in mountainous districts and in a flexible coupling, slipping with decreasing torque when overloaded.

621.316.721 : 621.318.381

1285 A TRANSISTORIZED CURRENT STABILIZER FOR AN ELECTROMAGNET. J.C.S.Richards.

Electronic Engng, Vol. 32, 22-3 (Jan., 1960).

Power transistors can be used to control large currents, but their rated maximum voltage is lower than desirable. By using an auxiliary electromechanical control system on the input to a stabilizer, this voltage limitation can be overcome. A typical unit, giving up to 4 A at 200 V, is described. Under normal conditions the current is stable to ±2 parts in 10^5 over an hour, and ±2 parts in 10^4 over ten hours.

621.316.721 : 621.318.3 : 535.2

1286 THE STABILITY OF PHOTO-ELECTRIC STABILIZERS FOR MAGNET CURRENTS. K.Weinhardt.

Z. angew. Phys., Vol. 11, No. 10, 403-7 (Oct., 1959). In German.

The frequency response and stability conditions for current stabilizers using galvanometer amplifiers are put into a form which enables a direct comparison with experiment to be made. Tests showed that a short term stability of current of 1 part in 10^6 could be obtained in a mass spectrometer magnet and a stability of 1 in 10^5 for several hours. T.Mulvey

621.316.722

1287 DETERMINATION OF THE ECONOMIC EFFICIENCY OF VOLTAGE REGULATION BY BOOSTER TRANSFORMERS. Z.Krishan.

Latv. PSR Zinat. Akad. Vestis, No. 8 (145), 47-50 (1959). In Russian.

Presents a simple mathematical analysis of the economics of different methods of voltage regulation, assuming an increasing load over the years. The use of boosters is shown to have no effect in practice on the size of the load at which an additional substation is desirable, or on the current density. Grid means of voltage regulation are thus economically advantageous in areas with small load density where the economic grid radii are large, whilst substations are often better erected at the load rather than the area centre. D.E.Brown

621.316.722

1288 HIGH-STABILITY D.C. AND A.C. MEDIUM-VOLTAGE SOURCES. II.

R.Stenzel and H.Helke.

Z. angew. Phys., Vol. 11, No. 11, 443-8 (Nov., 1959). In German.

For previous part, see Abstr. 897 (1955). Considers at first in general terms conventional types of feedback circuit employed with d.c. valve-regulated and with d.c. and a.c. transductor-regulated supplies. Attention is then concentrated on long-term stability such as is required for small power supplies in certain industrial processes. Here, as a reference standard, an h.t. battery, adjusted by potentiometer from time to time and renewed annually, is superior to a neon discharge tube. Still better is a dynamometer instrument movement where the permanent magnet acts as the essential reference standard. With such a device, a stability to within 5×10^{-4} over 10 000 hr has been achieved. H.G.M.Spratt

621.316.722.1 : 621.313.126

1289 THE APPLICATION OF SEMICONDUCTOR RECTIFIERS FOR CONTROL OF EXCITERS AND REGULATORS.

B.K.R.Prasad.

Elect. J., Vol. 163, No. 18, 870-1 (Oct. 30, 1959).

A general description of a system in which the exciter field is fed from the alternator output through a transformer, auto-excited transductor and rectifier. The transductor is controlled by a voltage sensing circuit which translates the r.m.s. value of alternator line voltage into d.c. signals. A Zener diode is used for reference. In a test where the load of a 75 h.p. induction motor was thrown on to a 150 kW brushless generator, the max. volt drop was 39% and recovered to within 2% of normal in less than 2 sec. P.Székely

621.316.722.1

1290 CONSTANT-CURRENT-COUPLED TRANSISTOR POWER SUPPLY. E.Gordy and P.Hasenpusch.

Electronics, Vol. 32, No. 41, 60-1 (Oct. 9, 1959).

Describes a stabilized power supply circuit in which nearly the whole of the output voltage variations are fed back to the control circuit by maintaining a constant bias current, from a common-base transistor stage, through the feedback resistor. F.F.Roberts

621.316.722.1 : 621.313.126

1291 PERFORMANCE OF MOTOR-DRIVEN EXCITERS WITH MAG-A-STAT VOLTAGE REGULATORS.

T.J.Bliss and M.Enns.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 779-89 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

It is shown that motor-driven main exciter sets having an inertia constant of 5 based on the kW rating of the exciter are capable of performances acceptably equivalent to the direct-driven type of exciter if the drive motor has a breakdown torque of not less than 500% at a slip of 10%. The fault conditions considered are sustained low generator terminal-voltage, a 2-second dead throwover or a 15 cycle fault following which synchronism with the system is just maintained by the generator. It is assumed that the motor terminal voltage was zero during the throwover and the fault, and but 70% of the rated value throughout the time of sustained low voltage and following the throwover and the fault. The performance of a Mag-a-stat voltage regulator was satisfactory during and following the abnormal operating conditions. G.V.Hargreaves

621.316.722/.726

1292 REGULATION OF AIRBORNE ROTATING INVERTERS. W.J.Kreider and N.Jasper.

Elect. Manufng, Vol. 64, No. 3, 103-7 (Sept., 1959).

Design, development and testing of a voltage- and frequency-regulating system for use on inertially guided ballistic missiles. Technical aspects and performance and measuring techniques are explained. Application to other than airborne systems is also discussed.

621.316.727

1293 POWER FACTOR IMPROVEMENT. FIELDS OF APPLICATION OF THE DIFFERENT TYPES OF EQUIPMENT. D.D.Stephen and H.K.Hadley.

Elect. Rev., Vol. 166, No. 3, 127-31 (Jan. 15, 1960).

621.316.728

1294 SOME ASPECTS OF THE PRODUCTION AND VALUATION OF THE REGULATION ENERGY IN AN ELECTRICAL SYSTEM. VIANDEN STATION AS AN EXAMPLE OF A REGULATING STATION. M.Cuenod.
Rev. E., Vol. 2, No. 11, 293-308 (1959). In French.

The suitability of hydraulic and thermal stations for supplying rapidly varying power is compared and information on the additional cost due to power variation is provided; the advantages of pumped storage are stressed. Methods for measuring the energy supplied by a station as its share towards the regulation of a system are described and its effect on power transfer between systems discussed. The importance of knowing the cost of this contribution in terms of cost per kW/sec is stressed. P.Linton

621.316.728

1295 THE USE OF POWER TRANSFER EQUATIONS TO DERIVE ECONOMIC CO-ORDINATION RELATIONSHIPS EXPRESSED AS FUNCTIONS OF VOLTAGE PHASE ANGLES.
A.R.Miller, H.R.Koen, Jr. and J.S.Deliyannides
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 747-54 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

The two main methods for determining the economic dispatch of power systems are known as the B-constant and the phase-angle methods. Developing the work of Brownlee on the phase-angle method, the authors put forward new equations which take account of the voltage phase angles of all generating plant and include the effects of different transmission-line constants and intermediate loads. Comparative studies show close agreement with the Brownlee method. A.P.Wilmshurst

PROTECTION

621.316.91 : 621.382.2

THE PROBLEMS OF OVERVOLTAGE IN CIRCUITS WITH GERMANIUM DIODES AND PROTECTION AGAINST OVERVOLTAGE.
See Abstr. 873

621.316.92 : 621.314.6

1296 RECTIFIER PROTECTION.
C.Owe.
Elektrotek. T., Vol. 72, No. 35-36, 501-10 (Dec. 15, 1959). In Norwegian.

A review of protective devices for mercury arc, contact and semiconductor (Ge and Si) rectifiers. Grid-blocking relays, current-limiting devices and radio and telephone interference suppression are considered for the Hg arc rectifiers. Rapid-operating circuit breakers and fuses for overvoltage and overcurrent protection, and safeguards against internal faults are dealt with for the semiconductor rectifiers. G.N.J.Beck

621.316.923.2

1297 DEVELOPMENT OF FUSES AND TERMINALS FOR HIGH-TEMPERATURE APPLICATIONS.
W.F.Bonwitt and H.Buttner.
Trans Amer. Inst. Elect. Engrs II, Vol. 78, 267-72 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

Describes the construction and materials of fuses and terminals for ambient temperatures of 600° F and 850° F respectively with other severe environmental conditions, corresponding to an altitude of 80 000 ft. Pre-insulated post-type crimped terminals which could be adapted for use as splices are considered, but the type of insulating material to be used is left in question. An uninsulated washer-type terminal not suitable as a splice is suggested for small wires. The properties and behaviour at high temperatures of nickel, silver and copper with various finishes are given in detail. The proposed fuses are of the non-h.b.c. type with a visual indicator for ratings up to 60 A. Conventional silver or nickel wire elements are used in a one-piece ceramic housing. Specification requirements are given but there are no test results. J.T.Hayden

621.316.925

1298 HIGH-SPEED DIRECTIONAL RELAYING.
A.Salzmann.
Elect. Times, Vol. 136, 255-9 (Sept. 24, 1959).

Overcurrent and impedance relays should be supplemented at any relaying point except the source of supply by high-speed directional relays in order to secure selective relay operation. It is essential to relate the relay connections to the system constants to produce (a) maximum torque and (b) prevent mal-operation under fault conditions. Present-day high-speed directional relays discussed in this paper are rectifier, induction cup and transductor types. G.V.Hargreaves

621.316.925

1299 PROTECTION OF THE 10 kV MAIN DISTRIBUTION SYSTEM OF THE PHILIPS FACTORIES AT EINDHOVEN.
B.Krediet.
Electrotechniek, Vol. 37, No. 25, 579-82 (Dec. 10, 1959). In Dutch.

The works obtain their power from a 150/10 kV transformer substation of the North Brabant supply authority. Distribution is by 3 × 240 mm² 10 kV cables feeding 5 more or less independent sections which can be intercoupled if required. The suitability of various forms of relay protection is discussed, the pilot-wire current comparison method being selected. An ordinary telephone cable is used in an "opposed-voltage" scheme. Special attention is paid to the voltage between the pilot wires in the telephone cables, and the stability of the system during external faults, the current transformers at both ends of the cables having unequal saturation at high over-currents. G.N.J.Beck

621.316.925

1300 A COMBINED FAULT CURRENT AND OVERVOLTAGE BREAKER AS THE MOST EFFECTIVE PROTECTION AGAINST OVERVOLTAGES AND FIRES. G.Prade.
Elektrotech. u. Maschinenbau (E.u.M.), Vol.76, No.17, 408-14 (Sept. 1, 1959). In German.

Research into variation in the electrical resistance of different types of soil, and the wide range of measurements obtained under varying climatic conditions leads the author to the conclusion that neither voltage-sensitive nor current-sensitive relays used alone can guarantee protection, particularly in the case of portable equipment used in civil engineering and mining operations. A combined fault-current and overvoltage breaker is described, which normally operates as an overcurrent relay, but incorporates in addition a voltage-sensitive coil. Should the fault-current be limited by high earth-resistance the voltage relay will operate to trip the breaker. D.R.Way

621.316.925.45

1301 SWITCHED DISTANCE PROTECTION.
A.Salzmann.
Elect. Times, Vol. 136, 659-64 (Dec. 3, 1959).

Switched distance protection, particularly for medium voltage networks, has found wide application as improved metal rectifiers and high-speed moving-coil relays have been developed. The decision to employ either a polarized mho-relay or an impedance unit supplemented by a directional element can be made only after consideration of the system lay-out. Single-relay schemes for resonant and solidly earthed m.v. networks are discussed and operational considerations, high-speed distance measuring units, switched impedance protection and double faults in resonant earthed systems are dealt with.
Central Electricity Generating Board Digest

621.316.932 : 621.314.2

1302 CONTRIBUTION TO INSULATION COORDINATION FROM THE POINT OF VIEW OF TRANSFORMER PROTECTION. M.Skála.
Energetika (Prague), Vol.9, No.11, 560-4 (1959). In Czech.

Discusses causes of overvoltages in very-high-voltage lines and compares transformer protection with rod-gaps and with valve-type lightning arresters. A method is shown for the determination of maximum permissible arrester distance from the transformer. Influence of surge waves on the turn insulation of transformers is briefly discussed and the protection provided by foreign and domestic surge arresters is compared. N.Klein

621.316.933.1

1303 NEW CURRENT-LIMITING GAP EXTENDS VALVE-TYPE LIGHTNING-ARRESTER PERFORMANCE.
J.W.Kalb and A.G.Yost.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 462-7 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

The design of a multiple spark-gap element working on the principle of arc elongation by a magnetic field is outlined. The gap is unique in that, in addition to deriving a high level of interrupting

ability from arc elongation, its high arc-voltage is the principle current-limiting factor for controlling power follow-current level. Thus a valve element of a low resistance can be used. These features enable the construction of a surge diverter having a small physical size and improved protective characteristics and durability. The performance of the new diverter is demonstrated by oscillographic records taken during different durability tests involving the use of either long-duration surge or combined surge and power follow-currents. E.M.Dembinski

621.316.95

1304 PROTECTIVE MEASURES AGAINST ELECTRIC STORM DAMAGE ON HIGH-VOLTAGE LINES AND THE PROBLEM OF LOCAL CONCENTRATION OF LIGHTNING DAMAGE. G.Lehmann.
Elektrizitätswirtschaft, Vol. 58, No. 13, 459-63 (July 5, 1959). In German.

The distributions are examined of lightning strokes to, and lightning damage on,the individual towers of several h.v. lines and with reference to several examples, it is suggested that these distributions are largely determined by geological features of the ground. The results of selected model tests are reviewed. R.H.Golde

621.316.99

1305 SAFETY IN A.-C. SUBSTATION GROUNDING.
Elect. Engng, Vol. 79, No. 1, 65-7 (Jan., 1960).

Under fault conditions, the flow of current to earth may result in possible hazardous voltage gradients in and around substations. An analytical approach to this subject, based on a study by A.I.E.E. Working Group 56.1, is described.

621.316.99

1306 CALCULATING OF RECTANGULAR EARTHING GRIDS. A.B.Oslon.
Elektrichestvo, 1959, No. 7, 79-81 (July). In Russian.

Calculations of the resistance of earthing grids using: (a) formulae developed in an earlier work (Abstr. 4631 of 1958); and (b) the same formulae and the simplifying assumption that the linear current density is the same for all grid elements (Maxwell's sub-areas), yield results which differ only by 3 and 5% respectively from these obtained by Gross and Hollitch (Abstr. 2739 of 1957), who, in their study, used an electronic digital computer. The method of applying the formulae is exemplified on a number of grids of different configurations. E.M.Dembinski

621.316.99 : 621.395.63

1307 PLANE/MULTIPLE/EARTHING OF TELECOMMUNICATION EQUIPMENT. O.Warmers and A.Ziegler.
Nachrichtentech. Z. (N.T.Z.), Vol. 12, No. 10, 497-500 (Oct., 1959). In German.

Two earthing systems are compared : (1) the star system in which earth conductors run from central points to individual equipments and earth loops are avoided; and (2) plane/multiple/earthing in which earthing conductors are joined together and form a multi-mesh network which covers the earthing requirements of the entire plant. The plane system is much more suitable when co-axial cables are used which join the earthing systems of different equipments. Safety-and working-earth are intimately connected in the plane system. The plane ensures a lower degree of interference, both low-and high-frequency, as well as increased safety as dangerous potential differences cannot arise in consequence of short-circuits and lighting. J.M.Silberstein

621.316.995

1308 THE WATER MAIN SYSTEM AND CABLE ARMOURING AS EARTH ELECTRODES. J.Sarvas.
Kraft o. Ljus, Vol.32, No.11, 253-8 (Nov., 1959). In Swedish.

In Finland water-main earthing has been common as regulations governing its use, such as exist in other countries, have not been framed. This is because d.c. supplies have not been widespread and the resulting corrosion problems were thus escaped. Water-main earthing is becoming less practicable as the use of pipe unions of insulating material and of plastic conduits increases. The following are proposed for investigation: (1) improvement of electrical conductivity of the unions; (2) installation of separate metal (Cu or Fe) conductors at the bottom of the trenches in which an insulating conduit is used. The use of cable armouring as earth electrode is considered in relation to the resistance to earth of the armouring which becomes too high when frost forms or under Finnish streets where the soil is too dry. G.N.J.Beck

621.316.995

1309 THE DISCHARGE OF IMPULSE CURRENTS THROUGH EARTH ELECTRODES. W.Bulla.
Österr. Z. ElektWirtsch. [Ö.Z.E.], Vol. 11, 406-16 (Sept.); 477-86 (Nov.); 506-8 (Dec., 1958). In German.

A comprehensive mathematical treatment, starting from first principles, of the propagation of impulse currents through extended earth electrodes. The internal surge impedance is determined first for conductors of constant permeability and then for magnetic material, the magnetization curve of which is replaced by two straight lines. The results obtained are applied to circular conductors of copper and iron and approximate values are derived for flat conductors. Numerical results are compared with tests in which the variation of surge impedance with time is plotted for a current with exponentially rising wave front. The basic mechanism is outlined of the effect of impulse currents on the ground surrounding an earth electrode. Displacement currents and electric breakdown characteristics of various types of soil are examined and variation with time of the voltage at the surface of a semi-sphere is determined and the results applied to extended flat electrodes. The field equations are derived for extended electrodes in infinitely large soils with a current injected into the centre point of the electrode. The propagation properties are developed of currents flowing through conductors buried at finite depths and the results are applied to the case of a conductor the axis of which lies in the earth surface. On the basis of the foregoing results the surge impedance of a buried conductor is derived for currents with infinitely steep and with final wave fronts. An estimate is made of the effects of finite length of the conductor and of soil breakdown. Finally, a simplified formula for the effective resistance of an extended earth electrode is discussed and several correction factors are plotted taking into account the various factors mentioned above. R.H.Golde

TRACTION . DRIVES

621.335.1

1310 AUTOMATIC CONTROL WITH TRANSDUCTOR FOR STARTING A.C. TRACTION VEHICLES. R.Germanier.
Bull. Assoc. Suisse Elect., Vol. 50, No. 22, 1053-61 (Oct. 24, 1959). In French.

A detailed description of each of the items in the circuit with special reference to the transductor. This feeds the blocking relay and acts as an impulse generator. The scheme is fully described with many diagrams and the action is explained step by step. R.G.Jakeman

621.335.2

1311 ELECTRIFICATION OF THE SURFACE LINES OF THE HOUTHALEN COLLIERYS. V.H.Lejong and P.P.Lams.
A.C.E.C. Rev., 1959, No. 3, 2-23. In French.

A very detailed description is given of the mechanical part and of the electric equipment of two types of standard gauge, 600 V locomotives, of the rectifier substation and of the overhead line. Heavy coal-trains are shunted and hauled from the colliery to the railway yard by means of these locomotives whose principal data are: type B_o-B_o, weight 60 tonnes, tractive effect at starting 22 000 kg, hauling up to 1800 tonnes train over the gradient of 1.3%; type B_o (two-axle), weight 40 tonnes, tractive effect at starting 11 000 kg. A.Karlsbad

621.335.2

1312 1000 h.p. DIESEL-ELECTRIC LOCOMOTIVE. O.S.Nock.
Engineer, Vol. 208, 768-71 (Dec. 11, 1959).

Summarizes results of tests carried out on a Type 1 locomotive of the type developed by British Railways primarily for freight service, but having a sufficiently high maximum speed to permit of occasional passenger working. The object of the tests was to obtain detailed performance and fuel consumption figures which would be sufficiently accurate and consistent to be used in planning timetables. Close correspondence between theoretical performance and test results made it possible to calculate train schedules with confidence from the designed characteristics of the locomotives. The paper is illustrated with performance curves and includes an explanation of the theory of traction-motor speed control by progressive field weakening. D.R.Way

621.335.2

1313 THE TWIN-FREQUENCY SHUNTING LOCOMOTIVES OF THE S.B.B. [SWISS FEDERAL RAILWAYS].

H.H.Weber.

Schweiz. Bauztg, Vol. 77, No. 46, 753-64 (Nov. 12, 1959). In German.

These locomotives operate at frontier stations, where the Swiss overhead 15 kV 16⅔ c/s system meets the French 25 kV 50 c/s one. The design of the mechanical parts of all locomotives is basically the same as that of the single-frequency Swiss shunters, with 3 coupled axles driven by a single motor. The equipment includes either a 554 kW single-phase commutator motor or a 520 kW d.c. motor fed by excitrons. Details of the equipment are given. A description is given of the relays for automatically changing the circuits to suit the overhead system and of an automatic device operated by a track magnet for opening the circuit-breaker in the dead section between the two systems.

A.Karlsbad

621.335.8

1314 DETECTOR CAR HISTORY AND NEW DEVELOPMENTS. H.W.Keevil.

Trans Amer. Inst. Elect. Engrs II, Vol. 78, 233-9 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

The frequent development of transverse fissure cracks in running rails in the U.S.A. up to 1926 led to development work on rail detector cars. Early work on resistivity measurement tests proved abortive and was followed by an inductive method without using rail contacts; this proved satisfactory, but later work on measuring residual magnetism which varied as cracks were found led to a preferred method which is detailed. A still later scheme employs ultrasonics and this is outlined. The original form of fissure-crack is now eliminated by metallurgical improvements.

E.H.W.Banner

621.336.223

1315 SOME CONSIDERATIONS REGARDING CURRENT COLLECTION FROM OVERHEAD LINES AND ADEQUATE CONTACT MATERIALS. C.Giagnoni.

Ingegn. Ferroviaria, Vol. 14, No. 10, 897-901 (Oct., 1959). In Italian.

Although since the introduction on the Italian State Railways of a systematic mechanical lubrication of the contact wire, the wear of the metallic contact strips (copper and steel) has been moderate, experiments have been made with non-metallic materials (carbon, Dixon grease, sinterized powders) with promising results. A long-service investigation is indispensable before deciding whether to use these materials in order to determine whether their higher cost is compensated by longer life of the contact wire. A.Karlsbad

621.34

1316 CONTROL OF SYNCHRONISM IN MULTIMOTOR-DRIVES IN THE FIBRE INDUSTRY. G.Kessler.

Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 22, 546-53 (Nov. 15, 1959). In German

See Abstr. 6358 of 1959. Individual partial-drives in paper-making and the textile industry are finding more and more application. The use of modern regulation methods in these drives is investigated in detail. "Synchronism" in this connection means that the speeds of the partial drives are adjusted and kept in such relation that the material passes undisturbed, under desired conditions, continuously through the machine. The various methods used are shown in schematic sketches, wiring diagrams and block diagrams of paper making machines, mercerizing machines and cotton cleaning machines. It is shown that the application of these regulation methods allows the attainment of a precision which, both statically and dynamically, is not inferior to that obtainable by mechanical means, and is in many cases superior to it. R.Neumann

621.34 : 621.311.22

1317 FROM LOGS TO NEWSPRINT.

Elect. Rev., Vol. 166, No. 3, 93-100 (Jan. 15, 1960).

A log yard and the installation of a grinder house, a preparation plant and two paper machines have recently been completed at Ellesmere Port. This extension is capable of producing over 500 tons of paper per day. To provide the necessary power, a new boiler plant with a total rating of 270 klb/hr and a 15 MW pass-out turbo-alternator have also been installed.

621.34 : 621.314.57

1318 FEEDING OF A MUTATOR-FED D.C. DRIVE ON A BUSBAR SHORT-CIRCUIT ON THE THREE-PHASE SIDE. M.Meyer.

Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 22, 784-7 (Nov. 11, 1959). In German.

The distribution of the short-circuit current in the secondary and primary windings of the transformer is investigated. The inductance of the armature circuit is then determined. This allows the maximum short-circuit current developing in the armature circuit to be calculated. The currents fed into the short-circuit by the mutator and by the three-phase supply are compared. All calculations are made with certain simplifying assumptions. Results of tests made with a model installation are given by oscillograms of current and voltage under various conditions. R.Neumann

CONDUCTORS . RESISTORS

(See also Semiconductor Materials)

621.315.51

1319 STRUCTURAL HARDENING COPPERS. THEIR CONSTRUCTIONAL, ELECTRICAL AND ELECTRO-THERMAL USES. G.Lafeuille.

Bull. Soc. Franc. Elect., Vol. 9, 492-503 (Sept., 1959). In French.

Reviews the progress of copper metallurgy from the beginning of the century and underlines in particular the hardenable coppers and their practical constructional, electrical, and electrothermal uses. Care must be exercised in using the correct copper for the job and in fabrication. Seven high-conductivity alloys are tabled, three work-hardened and four thermal-hardened. 7 references.

W.A.Walker

621.315.55

1320 OXIDATION STUDIES ON THE NICKEL-CHROMIUM AND NICKEL-CHROMIUM-ALUMINUM HEATER ALLOYS. E.A.Gulbransen and K.F.Andrew.

J. Electrochem. Soc., Vol. 106, No. 11, 941-8 (Nov., 1959).

A systematic study was made of the oxidation resistance of five 80 Ni-20 Cr heater alloys and one 4 Al-19 Cr-77 Ni alloy. Kinetic and crystal structure studies were made over the temperature range of 500° and 1100° C. The adhesion of the oxide film to the alloy was tested by the strain oxidation technique, and the overall performance was evaluated by the A.S.T.M. useful life tests. The rate of oxide tion of the several alloys could not be correlated with the A.S.T.M. useful life results, while the strain oxidation tests could be correlated with the A.S.T.M. useful life tests. Cr_2O_3 was the major odixe formed on the 80 Ni-20 Cr alloys at 1100° C. Although Al_2O_3 and Cr_2O_3 were observed below 1000° C on the 4 Al-19 Cr-77 Ni alloy, no Al_2O_3 was observed in the oxide scale at 1100° C. A thermodynamic and kinetic interpretation was made of the results.

621.315.55

1321 CONTROLLED NON-LINEAR SEMICONDUCTOR RESISTORS. V.V.Pasynkov and G.A.Savel'ev.

Elektrichestvo, 1959, No. 9, 72-3 (Sept.). In Russian.

Gives a brief account of the different methods of control. The superposition of one or more control voltages modifies the characteristic of varistor. References are given. P.Szekely

INSULATING MATERIALS
DIELECTRICS

621.315.61 : 537.2

1322 DIGEST OF LITERATURE ON DIELECTRICS. VOLUME 22 — 1958.

Edited by R.A.Soderman and L.J.Frisco.

Washington; D.C. : National Academy of Sciences — National Research Council Publication 713 (1959) 292 pp.

This annual volume is prepared by the Committee on Digest of Literature of the Conference on Electrical Insulation, Division of Engineering and Industrial Research. The papers are: Instrumentation and measurements, H.P.Hall and A.E.Sanderson (1-26) 270 refs. Table of dielectric constants, dipole moments and dielectric relaxation times, K.H.Illinger (27-55) 78 refs. Molecular and ionic interactions in dielectrics, T.D.Callinan (57-73) 148 refs. Conduction phenomena in solid dielectrics, J.Rolfe and F.R.Lipsett (75-98)

154 refs. The breakdown of dielectrics, J.C.Devins and S.I.Reynolds (99-119) 142 refs. Ferroelectric and piezoelectric materials, W.R.Cook, Jr and H.Jaffe (121-47) 339 refs. Ferromagnetic materials, K.Dwight, N.Menyuk, R.Arnott, M.Cohen, J.B.Goodenough, E.E.Huber, Jr, D.O.Smith, R.F.Soohoo, G.P.Weiss, A.Wold and D.G.Wickham (149-207) 500 refs. Rubber and plastic insulation, S.Palinchak and B.Bennett (209-38) 186 refs. Insulating films, H.A.Birdsall (239-51) 64 refs. Insulating liquids and their applications, D.H.Hogle (253-61) 41 refs. Ceramic insulation, J.G.Leschen (263-9) 53 refs. Engineering applications, E.S.Yates; C.A.Long; A.J.Warner (271-2, 272-5, 275-92) 164 refs.

621.315.61 : 537.2 : 539.2 : 532.7

1323 EFFECTS OF GAMMA RADIATION AT 25°C ON SILICONE DIELECTRICS. C.G.Currin.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 297-308 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

This is a rather thorough investigation of the effect of radiation from a cobalt-60 source on various silicones. Total irradiation doses ranged up to 1000 Mrad, the rate being of the order of 0.5 Mrad/hr. The materials tested were silicone fluids of various types, compounds, elastomers and resins. Physical and dielectric properties were measured after different doses, some measurements also being made during irradiation, when transitory effects were found. On the whole, the fluids suffered the most damage, while the silicone resins were least affected.

K.W.Plessner

621.315.61 : 621.313.1

THE ESTABLISHMENT OF A BASE FOR CLASS A RANDOM-WOUND-MOTOR INSULATION LIFE BY A.I.E.E. STANDARD NO. 510 TEST PROCEDURE AND ITS CORRELATION WITH FIELD EXPERIENCE. See Abstr. 1181

621.315.611 : 537.2 : 539.2

1324 THE DIELECTRIC BEHAVIOR OF SOLIDS EMBEDDED IN A HOMOGENEOUS MEDIUM. B.R.Eichbaum.

J. Electrochem. Soc., Vol. 106, No. 9, 804-9 (Sept., 1959).

Dielectric constant and tan δ of powdered crystal phases of alumina, quartz, and wollastonite were determined. Since it is very difficult to obtain dielectric measurements of very fine (powdered) crystals, a technique of embedding the solids in a homogeneous medium was used. The relationship between particle shape and volume present in the composite to the dielectric properties of such fine powders was in accord with that indicated by Niesel's theory (1953).

621.315.612

1325 NUCLEAR RADIATION EFFECTS ON ELECTRICAL CERAMICS. W.E.Rowe and J.R.Johnson.

Elect. Manufng, Vol.64, No.2, 93-7 (Aug., 1959).

Tabular data is presented covering the nature and extent of nuclear radiation damage to ceramic materials used in electrical applications. Background information provides definitions of nuclear radiation, lists electrical ceramics, and cites their applications.

621.315.612.6

1326 GLASS-FIBRE AS INSULATION- AND CONSTRUCTION-MATERIAL FOR LOW-VOLTAGE EQUIPMENT. K.A.F.Schmidt.

Elektrotech. Z. (E.T.Z.) B, Vol. 11, No. 10, 391-7 (Oct. 21, 1959). In German.

Surveys the forms and properties of glass-fibre, and its applications, both by itself and in combination with plastics and synthetic resins. I.D.L.Ball

621.315.615

1327 OILS AND OTHER INSULATING MATERIALS (C.I.G.R.E., 1958). Z.Siciński.

Przegląd elektrotech., Vol. 35, No. 6, 252-9 (June, 1959). In Polish.

The conclusions of seven papers are given concerning the following questions: (i) the use of non-inflammable oil in transformers and capacitors with discussion of the characteristics of capacitor oils; (ii) dielectric characteristics of insulating oils; (iii) the influence of moisture on ageing of oil-impregnated-paper insulation in transformers; and (iv) improvement of stator insulation in large alternators. M.W.Makowski

621.315.615.2 : 532.7 : 535.37

1328 LUMINOUS SPOTS ON ELECTRODES IN INSULATING OIL GAPS. T.W.Dakin and D.Berg.

Nature (London), Vol. 184, 120 (July 11, 1959).

These spots, which had been seen before, were re-examined with more refined techniques. They occurred only at the negative electrode with d.c. stresses in well-filtered degassed oil. They are attributed to fluorescence of oil molecules excited by field-emitted electrons from points of locally high stress on the electrodes. The threshold stress was of the order of 50-250 kV/cm. This suggests the origin of gas development in stressed oils, since the 4eV for decomposition of the molecules is not much greater than the 3eV for fluorescence. I.D.L.Ball

621.315.616

1329 STABILITY OF ORGANIC SYNTHETIC MATERIALS. P.Nowak.

Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 20, 692-8 (Oct. 11, 1959). In German.

Survey of modern methods for testing the stability and ageing under various conditions of organic synthetic materials used in electrical machines, cables etc. H.Norel

621.315.616

1330 PLASTICS FOR LOW TENSION SWITCHGEAR. H.Hoffmann and A.Pfeiffer.

Elektrotech. Z. (E.T.Z.) B, Vol. 11, No. 10, 405-9 (Oct., 1959). In German.

Reviews the types of plastic materials available for electrical use with particular reference to small l.v. switchgear and differentiates between the types which are most suitable for employment in areas of high dielectric stress and the cheaper thermoplastics suitable for areas of low stress, e.g. covers and other unstressed parts. References to synthetic varnishes for winding insulation and the various plastic adhesives are included. Standard tests are described and tables of comparative characteristics for different, but related, plastics are shown. D.R.Way

621.315.616

1331 POLYCARBONATES IN THE ELECTRICAL INDUSTRY. H.Hofmeier.

Elektrotech. Z. (E.T.Z.) B, Vol. 11, No. 10, 412-15 (Oct. 21, 1959). In German.

A review of the properties and applications of polycarbonate foil ("Makrofol"). Thicknesses down to 0.010 mm are available, the latter being made by stretching a thicker foil in order to maintain the thickness tolerance at ±10%. The stretched foils relax under a suitable heat treatment and can be used, e.g. in capacitors, to provide extremely tight windings. K.W.Plessner

621.315.616

1332 EFFECT OF HIGH TEMPERATURE AND NUCLEAR RADIATION ON SILICONE INSULATION SYSTEMS. C.G.Currin and F.A.Smith.

Elect. Manufng, Vol. 64, No. 4, 110-16, 179 (Oct., 1959).

621.315.616.7

1333 BUTYL RUBBER IN THE CABLE INDUSTRY. W.Grabowski.

Elektrotech. Z. (E.T.Z.)B, Vol. 11, No. 10, 423-5 (Oct. 21, 1959). In German.

The field of application of butyl rubber-insulated cables is discussed and a comparison with natural rubber is made. The chemical constitution of butyl rubber is explained and it is shown that it can be applied to the conductor by the same methods as are in use for natural rubber. K.W.Plessner

621.315.616.7 : 621.313.1

SILICONE MATERIALS IN ELECTRIC MACHINE CONSTRUCTION. See Abstr. 1179

621.315.616.9

1334 TECHNOLOGY OF PLASTICS FOR HIGH VOLTAGE ENGINEERING. W.Oburger.

Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 20, 682-8 (Oct. 11, 1959). In German.

A survey explaining in relatively simple terms the molecular conditions on which the various groups of insulating materials, and especially synthetics, are based. Thermoplastic, thermosetting and other groups are discussed and the more widely known individual materials in each of these are listed and their properties briefly described. H.Norel

621.315.616.9

1335 ON THE ELECTRIC BREAKDOWN STRENGTH OF PLASTICIZED POLYVINYLCHLORIDE (P.V.C.). M.Kreiss.
Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 21, 751-6 (Nov. 1, 1959). In German.

Results of short-term and longer term breakdown tests at 50 c/s are reported on specimens of p.v.c. containing known amounts of plasticizer. The samples were either in the form of sheets of various thicknesses or of wire insulation between concentric-cylinder electrodes. With the latter, the effects of conductor diameter ratio and of insulation thickness were investigated. The influence of elevated temperatures was also studied. The results are compared with previous work and a discussion of possible breakdown mechanisms is included. K.W.Plessner

621.315.616.9

1336 POLYETHYLENETEREPHTHALATE FOIL IN THE ELECTRICAL INDUSTRY. E.Gwinner.
Elektrotech. Z. (E.T.Z.)B, Vol. 11, No. 10, 419-22 (Oct. 21, 1959). In German.

A review of the properties and applications of this foil, better known as "Melinex", "Mylar", "Hostaphan" or "Terphane". K.W.Plessner

621.315.616.9

1337 FOAMED PLASTICS AS INSULATORS IN THE ELECTRICAL INDUSTRY. F.Stastny.
Elektrotech. Z. (E.T.Z.)B, Vol. 11, No. 10, 425-6 (Oct. 21, 1959). In German.

The use of foamed plastics in high-frequency and in telephone cables is reviewed. The principal electrical and physical properties are given of normal foamed polythene, of a product with a particularly low density and of foamed polystyrene, which is applied in the form of a lapped tape. K.W.Plessner

621.315.616.9

1338 EFFECTS OF THERMAL ENVIRONMENT ON LAMINATED PLASTICS. S.W.Place.
Elect. Manufng, Vol. 64, No. 3, 145-7 (Sept., 1959).

The effects of heat and moisture on the dimensional stability and mechanical and electrical characteristics of thermo-setting laminates are correlated in relation to various test methods. Material is based on property evaluations and standards by A.S.T.M., N.E.M.A. and Johns Hopkins University. A partial list of A.S.T.M. test methods most frequently used in evaluation of laminated plastics is also given.

621.315.616.95 : 621.313.1

1339 THE USE OF SYNTHETIC RESINS ON HIGH VOLTAGE WINDINGS OF ELECTRICAL MACHINES. H.Meyer.
Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 20, 719-24 (Oct. 11, 1959). In German.

Brief account of past and present uses of synthetic resins, combined with mica, in the insulation of rotary electrical machines. Reference is made to a practical example of synthetic resin insulation without mica and of the prospects of this type of insulation for the future. H.Norel

621.315.616.96

1340 PROGRESS ATTAINED BY EPOXY RESINS IN H.T. APPARATUS. A.Catella.
Bull. Soc. Franc. Elect., Vol. 9, 544-50 (Sept., 1959). In French.

A discussion of the advantages obtained by the use of epoxy resins in conjunction with glass fibre. It is shown that a considerable saving is made in the size of apparatus, exemplified by lightning-arresters, current transformers and circuit-breakers, both oil-poor and pneumatic. R.G.Jakeman

621.315.616.96 : 621.316.57

1341 DIELECTRIC ENDURANCE TESTS ON SYNTHETIC RESIN CONTAINERS. RESULTS OBTAINED. FUTURE PROSPECTS. A.Guillaume.
Bull. Soc. Franc. Elect., Vol. 9, 561-3 (Sept., 1959). In French.

A 72.5 kV circuit-breaker case of epoxy-resin has been on outside test for 33 months in an industrial atmosphere with 48 kV applied. Brush discharges and some tracking were noticed during heavy rain, but if the surface was given an occasional wipe, the initial properties were maintained. I.D.L.Ball

621.315.616.96

1342 THE BREAKDOWN VOLTAGE OF EPOXY RESINS IN NON-UNIFORM FIELDS. M.Eberhardt.
Wiss. Z. Tech. Hochsch. Dresden, Vol. 8, No. 1, 107-11 (1958-59). In German.

In contrast to test methods using uniform fields, breakdown voltages can be easily determined even for large electrode spacings if non-uniform fields are applied. For the investigation of thermo-setting epoxy-resins, containing silica-powder fillers in different ratios, an electrode arrangement consisting of a 50 mm circular plate and a needle projecting into the centre of the plate was used. Tests carried out in temperature-controlled oil baths show the following results: the breakdown voltage increases linearly for electrode spacings between three and nine mm: increasing the silica-powder content from 100 to 200% of the weight of epoxy resin increases the breakdown voltage. In endurance tests of round insulating bars with 20 cm electrode spacing the epoxy resin has proved itself to be superior to paper- or fabric-based bars subjected to electric stresses in the direction of lamination. 5 references. E.Erdelyi

621.315.617.3 : 621.313.1

SOLVENTLESS IMPREGNATING VARNISHES. See Abstr. 1180

621.315.619 : 621.313.12

1343 GENERATOR INSULATION SYSTEMS DEVELOPMENT FOR HYPERSONIC AIRCRAFT.
W.B.Penn, R.L.Balke and F.M.Precopio.
Trans Amer. Inst. Elect. Engrs II, Vol. 78, 255-9 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

Reviews the progress in the development of insulation systems aimed at operating at temperatures of 500°C. Tests on the capabilities of currently available silicone materials are described with the development of the test fixture. Further tests to evaluate solventless silicones compounded with fillers such as silica and glass are outlined, with work at present in hand on ceramic encapsulating compounds and glazes, and also micaceous and quartz insulations. J.T.Hayden

MEASURING METHODS
ELECTRICAL TESTING

621.317.2

1344 DEVELOPMENT OF TESTS OF ELECTRICAL EQUIPMENT WITH HIGH VOLTAGE. R.Čížek.
Elektrotech. Obzor, Vol.48, No. 10, 536-8 (1959). In Czech.

Brief survey of development, discussing also dimensioning of laboratory halls. A table gives main data of test equipment in 23 h.v. laboratories. N.Klein

621.317.2

1345 ASEA'S HIGH-POWER LABORATORY. B.Thorén.
E.R.A. (Stockholm), Vol. 32, No. 10, 119-21 (1959). In Swedish.

The main purpose of the laboratory is to test high-power circuit-breakers and transformers. Generators are installed in a special machine hall and remote-controlled isolators enable several tests to be conducted simultaneously. Turbo-generators of low reactance and high short-circuit strength are used. The equipment is designed for a s.c. power of 2000 MVA, achieved with a generator rated at 2500 MVA and transformers for 9000 MVA. Parallel coupling with an older 1000 MVA generator enables the s.c. output to be raised to 2500 MVA. The laboratory is fed at 10 kV and distribution in it is at 3.3 kV. G.N.J.Beck

621.317.3

1346 AN INTRINSICALLY SAFE ELECTRICAL TRANSDUCER. A.Franz.
Elektrotech. Z. (E.T.Z.) B, Vol. 11, No. 9, 365-7 (Sept. 21, 1959). In German.

The transducer is of the torque-balance type, and produces in its output circuit d.c. which is proportional to the torque of its primary electrical measuring element. Unbalance is detected by a coil which swings in the field of an a.c.-energized fixed coil. The induced voltage is amplified by a two-stage transistor amplifier,

rectified, and the resulting current passed through the moving-coil of the d.c. counter-torque element. The transducer is energized from 220 V 50 c/s mains through a screened transformer, and is rendered intrinsically safe in explosive atmospheres by limiting the possible fault current or voltage. The devices used are: a fuse in the primary circuit of the transformer to prevent overloading; a 7 V Zener diode to limit voltage rise; resistors to limit short-circuit currents; the total inductance of the d.c. receiving instruments is limited to <10 mH. C.F.Pizzey

621.317.312

1347 ACCURACY OF MEASUREMENT OF HIGH A.C. VOLTAGES BY THE SPHERE GAP WITH MEASURING SEGMENT. W.Frischmann.
Elektrie, Vol. 13, No. 9, 322-6 (Sept., 1959). In German.

A.C. tests were undertaken on 50 cm and 150 cm sphere gaps to determine the effect on the accuracy of measurement of the size and method of fitting of segments in one of the spheres of a gap used as a capacitive potential divider. Calibration curves show breakdown voltage as a function of distance for normal spheres and for a sphere with segments which are deliberately protruding or recessed. With perfectly fitting segments, the breakdown voltages of a sphere gap lie within the standard permissible error of ± 3%. For protruding or recessed segments, the geometries are determined for which the permissible tolerances are satisfied. It is suggested that sphere gaps with segments be included in national standards and that further measurements be performed with d.c. and under impulse. R.H.Golde

621.317.32 : 537.54 : 537.7

1348 PRECISION CAPACITOR DIVIDER METHOD FOR MEASURING HIGH VOLTAGES.
H.V.Larson and I.T.Myers.
Rev. sci. Instrum., Vol. 30, No. 11, 1022-4 (Nov., 1959).

A high-precision capacitor divider method for measuring the voltage on the terminal of a 2 MV Van de Graaff accelerator is described. Calibration of the system was done using the Be(γ,n) threshold reaction. Linearity was tested using a total beam calorimeter and a beam current integrator.

621.317.333 : 621.319.4

1349 THE INFLUENCE OF INTERNAL DISCHARGE PHENOMENA ON THE DESIGN OF CAPACITOR DIELECTRICS. H.Neumann and J.Smolka.
Elektrie, Vol. 13, No. 6, 212-18 (June, 1959). In German.

A method of detecting internal discharges based on a Schering bridge and a 10 kc/s amplifier is described. Results of discharge inception and extinction voltage measurements on oil-impregnated paper capacitors are given as a function of temperature, pressure and dielectric thickness. The behaviour of oil- and of chlorinated-diphenyl-impregnated paper is compared as regards the time dependence of internal discharges. The implications of the results in the design of power capacitors are discussed. K.W.Plessner

621.317.333

1350 THE RELATION OF CAPACITANCE INCREASE WITH HIGH VOLTAGES TO INTERNAL ELECTRIC DISCHARGES AND DISCHARGING VOID VOLUME. T.W.Dakin.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 790-5 (1959) = Pwr Apparatus Syst., No. 44 (Oct., 1959).

Analysis indicates that the increase of capacitance with voltage, in the presence of discharges, gives a better indication of the volume of discharging cavities than variation of loss angle with voltage. J.H.Mason

621.317.333

1351 INSULATION-RESISTANCE MEASUREMENT TECHNIQUE FOR CARBON-COMPOSITION RESISTORS. E.N.Wyler and H.S.Floyd.
Instrum. Control Syst., Vol. 32, No. 9, 1370-1 (Sept., 1959).

Measurements of insulation resistance on carbon-composition resistors reveals variations due to contact area, test-voltage, test duration time and surface conditions. The experiments described compare variabilities contributed by three different body contacting methods, the V-strap, metal foil and a stainless steel strap bonded to a 0.075 inch layer of resilient, electrically conductive silicone rubber; two different values of applied voltage 85V and 500V; two surface conditions, wet and dry. Results indicate minimum variability when the test voltage is 500V, the insulation resistance is measured 10 sec after applying the voltage, the contact is made to a dry specimen using the silicone rubber. J.MacCormack

621.317.333.4

1352 IMPLEMENTATION OF THE RADAR METHOD AND RESULTS OF ITS USE. M.Maugard.
Bull. Sci. Assoc. Ingen. Montefiore (A.I.M.), Vol. 72, No. 9, 545-57 (Sept., 1959). In French.

Localization of faults on power and telecommunication lines by means of a pulse generating equipment is described. A c.r.o. with circular trace is used for echo distance measurement. Echo polarity and shape indicates the nature of the fault. A number of specific power circuits thus equipped are briefly described. 12 photographs, 19 references. A.Reiss

621.317.333.4 : 621.315.28

1353 FAULT LOCATOR EXPEDITES REPAIRS ON PLUM ISLAND SUBMARINE CABLE. N.E.Piccione.
Elect. Wld, Vol. 152, No. 21, 52-4 (Nov. 23, 1959).

The cable concerned was a 9600 ft 13.2 kV power cable and the distance of the fault from one end was determined within a few minutes by means of a pulse-echo measuring equipment operating at a p.r.f. of 500/sec. Diagnosis of the nature of faults in general by the shape and polarity of the echo pulse is explained. Brief reference is made to high-voltage burning equipment which produces final breakdown at a high-resistance fault, so facilitating location, and to the application of sonar which assists in locating faults by measurements external to the cable. H.G.M.Spratt

621.317.333.4 : 621.313.1

1354 THE LIFE EXPECTANCY OF CLASS A RANDOM-WOUND MOTOR INSULATION AS DETERMINED BY A.I.E.E. STANDARD No. 510 TEST PROCEDURE.
Trans Amer. Inst. Elect. Engrs II, Vol. 78, 224-8 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

A report on the results obtained by 9 laboratories when testing the life expectancy of a large number of motors and motorettes in accordance with A.I.E.E. Standard No. 510. It appears that present-day insulation systems for these motors wound in accordance with American Standards have an extrapolated life of between 5000 and 15000 hours at 105°C, when tested in accordance with A.I.E.E. No. 510. It is considered that the data is not consistent enough to warrant standards being based on these figures. It was therefore decided to undertake a new test programme following a revision of A.I.E.E. No. 510. The proposed revision is given in full. R.G.Jakeman

621.317.333.82

1355 SOME ASPECTS OF HIGH VOLTAGE INSULATION TESTING. V.L.Ivanov, V.M.Nashatyr and I.F.Polovoi.
Elektrichestvo, 1959, No. 7, 61-4 (July). In Russian.

Circuits are described for producing test voltages simulating switching overvoltages in transmission systems. The test waveform is obtained by superimposing an oscillation (f = 150/500 c/s) on the 50 c/s voltage wave. This oscillation, which may be applied on either side of the h.v. testing transformer, is derived from a conventional LC circuit or a modified impulse generator circuit. Some experimental results are included. E.M.Dembinski

621.317.335 : 539.2 : 537.2

1356 AN ABSOLUTE METHOD OF MEASUREMENTS OF DIELECTRIC PROPERTIES OF A SOLID USING A π-SHAPED RESONATOR. O.V.Karpova.
Fiz. tverdogo Tela, Vol. 1, No. 2, 246-55 (Feb., 1959). In Russian.

Describes an absolute method of measuring permittivity (ϵ) and tan δ of a cylindrical sample in a π-shaped cavity. The resonance curve with the sample in the resonator yields the resonance wavelength λ, and then a calibration curve, $\epsilon = f(\lambda)$, is used to find ϵ. The error is determination of permittivity values up to $\epsilon = 30$ is less than 1% and it is independent of the sample dimensions. The value of tan δ can be found from the Q-factor of the resonator with the sample in it. The values of ϵ and tan δ of five substances (polystyrene, ebonite, sulphur, sodium chloride and titanium dioxide), measured at λ = 15-43 cm, were generally in agreement with the published data. A.Tybulewicz

621.317.34

1357 GONIOMETER MEASURING ARRANGEMENTS FOR HIGH FREQUENCIES. H.Fricke.
Arch. tech. Messen, No. 283, (V 376-9) 153-6 (Aug.); No. 286, (V 376-10) 225-6 (Nov., 1959). In German.

Descriptions are first given of the construction of (a) short-circuit, (b) matching types of goniometer and then their application to the measurement of admittance, frequency and phase angle is described in some detail. Numerous references are given to relevant publications. A.Wilkinson

621.317.34

1358 APPROXIMATE DISTRIBUTIONS OF NOISE POWER MEASUREMENTS. W.Freiberger and U.Grenander.
Quart. appl. Math., Vol. 17, No. 3, 271-83 (Oct., 1959)

The frequency functions of certain spectral estimates are studied analytically and numerically. An approximation is obtained for the case of a Poisson weight function and compared to the true distribution. The eigenvalues of products of Toeplitz matrices play a crucial role in the sampling theory of quadratic forms; an approximation to their distribution is discussed and its accuracy studied numerically. This leads to approximate probability densities which are thought to be valid for moderate or even small sample sizes.

621.317.36

1359 USING LOW-FREQUENCY STANDARD BROADCASTS. H.F.Burgess and M.C.Jones.
Electronics, Vol. 32, No. 44, 48-9 (Oct. 30, 1959).

The National Bureau of Standards transmits from Boulder, Colorado, on standard frequency of 60 kc/s. A simple comparison system incorporating a coherent detector enables any local 100 kc/s sub-standard oscillator to be checked against this transmission, to an accuracy of 1 part in 10^8, in a single test lasting 15 minutes.

D.E.Rae

621.317.36 : 621.376.3

1360 ONE METHOD OF MEASUREMENT OF INSTANTANEOUS FREQUENCY OF FREQUENCY-MODULATED OSCILLATIONS. A.A.Vasil'ev.
Radiotekhnika, Vol.14, No.10, 64-72 (Oct., 1959). In Russian.

A method using no resonant circuits is described, and which ensures high accuracy of measurement of fast variable frequency. Mathematical analysis and the limits of accuracy are given. Apparatus built on the principle described can display measured frequencies on a c.r.t.

A.Woroncow

621.317.361 : 621.373.421.13

1361 A STUDY OF THE VARIATIONS IN QUARTZ FREQUENCY STANDARDS OF THE NATIONAL ELECTRONIC TECHNICAL INSTITUTE. M.Boella.
Atti Accad. Sci. Torino I, Vol. 93, No. 2, 288-300 (1958-59).
In Italian.

Four frequency standards have been constructed with a nominal frequency of 100 kc/s. They differ in the means adopted to support the resonator. Measurements have been made over a period of six months by comparison with the signals from MSF and WWV Measurements have also been made between one unit and another. It is concluded that day-to-day stability is about 5 parts in 10^{-10}. The installation is underground, under conditions of very favourable thermal and mechanical stability.

S.C.Dunn

621.317.361

1362 COMPARISON AT A DISTANCE OF THE ATOMIC FREQUENCY STANDARDS BY MEANS OF TRANSMISSIONS ON MYRIAMETRIC WAVELENGTHS.
B.Decaux and A.Gabry.
C.R. Acad. Sci. (Paris), Vol. 249, No. 21, 2165-7 (Nov. 23, 1959).
In French.

Comparisons between the caesium atomic frequency standards of the C.N.E.T. (Bagneux) and N.P.L. (Teddington) have been made since March, 1959 by simultaneous night-time frequency measurements of the Rugby (GBR) transmissions on 16 kc/s. The mean differences found are of the order 10^{-10}s.

G.M.Brown

621.317.37 : 621.313.322

1363 GENERATOR LOAD-ANGLE MEASURING EQUIPMENT FOR MARCHWOOD. N.S.Annis.
Brit. Commun. and Electronics, Vol. 6, No. 12, 850-3 (Dec., 1959).

A digital technique is described for the direct on-site measurement of generator load angle. In this particular installation, indication is also provided in the plant control room for general observation and recording purposes.

621.317.37 : 621.313.3

1364 MEASUREMENT OF THE INTERNAL PHASE ANGLE OF AN ALTERNATOR BY MEANS OF AN ELECTRONIC CHRONOMETER AND ITS APPLICATION TO THE MEASUREMENT OF SYNCHRONOUS REACTANCE. É.Pillet and M.Sabatier.
C.R. Acad. Sci. (Paris), Vol. 249, No. 17, 1620-1 (Oct. 26, 1959).
In French.

A large-diameter disk rigidly attached to the rotor carries a permanent-magnet needle which generates an electric impulse each time it passes between the poles of an electromagnet. This impulse is amplified and trips the chronometer. The waveform generated by the alternator is applied to a second circuit similar to the first. The alternator is first tested on no-load, when E and V should coincide, in order to determine the circuit constant. Subsequent readings are taken at increasing load values and the phase angle for each current can be read directly. Results obtained using this apparatus indicate that the internal phase angle describes a hysteresis loop, the width of which depends on the degree of saturation of the magnetic circuit and the output current. The synchronous reactance is directly proportional to the saturation of the magnetic circuit and inversely proportional to the output.

D.R.W.Way

621.317.38 : 621.313.32

1365 THE MEASUREMENT OF TRANSIENT TORQUE AND LOAD ANGLE IN MODEL SYNCHRONOUS MACHINES. R.N.Sudan, V.N.Manohar and B.Adkins.
Proc. Instn Elect. Engrs, Paper 3151S, publ. Feb. 1960 (Vol. 107A, 51-60).

Deals with the development of equipment for measuring the torque and load angle of an electrical machine under transient conditions and its use in verifying some theoretical results. The equipment is used in conjunction with a "micro-alternator", which is a small machine specially designed to simulate a large generator. The torque meter uses resistance strain gauges mounted on a special coupling connected mechanically to the machine shaft. The load-angle meter operates by generating a succession of pulses which modulate the intensity of an oscillograph beam as it traverses a periodic wave. The experiments recorded relate to the following conditions: (1) oscillations superimposed on steady operation as a synchronous machine; (b) sudden short-circuit of an alternator.

621.317.38 : 621.313.32

1366 TRANSIENT TORQUE AND LOAD ANGLE OF A SYNCHRONOUS GENERATOR FOLLOWING SEVERAL TYPES OF SYSTEM DISTURBANCE. D.B.Mehta and B.Adkins.
Proc. Instn Elect. Engrs, Paper 3160S, publ. Feb. 1960 (Vol. 107A, 61-74).

Develops theoretical methods of calculating the variation of torque and load angle of a synchronous machine connected to a fixed supply voltage. In order to supplement and explain the results of recent full-scale tests the following conditions are considered: (a) condition after a sudden short-circuit; (b) condition after switching in a reactance between the generator and the supply; (c) asynchronous operation; (d) resynchronization after asynchronous operation. The theory was verified experimentally using a model alternator or "micro-alternator" and test equipment previously developed for measuring variations of torque and load angle of a small synchronous machine (see preceding abstract).

621.317.39 : 621.313.047

1367 A CONTACTLESS METHOD OF MEASURING DIMENSIONAL DEVIATION. F. Bruschnik.
Brown Boveri Rev., Vol. 45, No. 11-12, 529-32 (Nov.-Dec., 1958)

A device specially designed for measuring deviations from a true cylindrical shape in rotating machine parts is described. Phenomena occuring at the periphery of the object being tested are made visible on a cathode-ray tube and can be photographed. An optical synchronizing system ensures that the trace stands absolutely still, while a horizontal sweep generator in the actual device allows the scale of the trace to be enlarged at any point on the periphery. The main field of application is the investigation of commutation phenomena and the measurement of commutators; deviation from true can be measured to an accuracy of 10^{-3} mm.

621.317.39

1368 A CAPACITIVE PROBE FOR THE MEASUREMENT OF VERY SMALL DISPLACEMENTS IN THE FREQUENCY RANGE 50 c/s-2 Mc/s. H.Herold and A.Lenk.
Hochfrequenztech. u. ElektroAkust., Vol. 68, No. 5, 152-8 (Dec., 1959). In German.

The apparatus was developed to measure displacements between 10^{-10} and 10^{-8} m, in the investigation of the properties of piezoelectric materials. The varying capacitance between the vibrating sample and the probe produced frequency modulation of an oscillator working at 62.5 Mc/s. The usual limiter and discriminator were followed by a 5-stage amplifier and a valve voltmeter. A d.c. valve voltmeter following the discriminator enabled the oscillator to be tuned to the discriminator null during setting up of the test table,

and could be used for static calibration. Dynamic calibration was provided by vibration of the probe itself, driven by a $BaTiO_3$ plate excited well below resonance with a known voltage. W.G.Stripp

621.317.39 : 621.398

1369 THE TELEPULSE REMOTE GAUGING SYSTEM. A.C.Ferguson and I.W.F.Paterson.
Brit. Commun. and Electronics, Vol. 6, No. 12, 862-5 (Dec., 1959).

A pulse telementry system is described for the remote indication of liquid level and temperature in oil refineries and tank farms.

621.317.39

1370 VEHICLE PERFORMANCE MEASUREMENT. R.W.Leng.
Elect. Rev., Vol. 165, No. 12, 539-43 (Oct. 30, 1959).

Electrical resistance strain-gauges are widely used in testing prototype vehicles. For measuring static strains, each strain gauge circuit is connected in turn with a potentiometer and galvanometer circuit. For measuring dynamic strains, the strain gauge circuits are balanced initially by a potentiometer circuit and then connected with a multichannel recorder. The gauge circuits are fed with a.c. at 2 kc/s and the output is amplified and demodulated before being fed to the recorder. Dynamic force measurements are made on steering linkages, axles and other components by attaching strain gauges to them, while load cells are employed to test other components. Vehicle speed is measured by a light-weight trailing wheel carrying a slotted disc through which light is shone upon a photocell. The pulses generated are fed to a transistorized frequency meter. Coasting deceleration tests are made in which decade counters controlled by a gating circuit determine the number of revolutions of one of the wheels during successive time intervals. Tape recorders are used to record noises within the car and the record is fed through a wave analyser. Analogue computers are used to study the performance of spring and damping systems.

A.C.Whiffin

621.317.39

1371 HIGH RESOLUTION ANGLE TRANSDUCER AND ENCODER.
L.G.deBey, D.Comstock, S.B.Peterson and R.C.Webb.
Electronics, Vol. 32, No. 42, 78-81 (Oct. 16, 1959).

The apparatus described transmits the angular position of a shaft to an accuracy of 0.001°. The position of the shaft is determined in two stages. Firstly, a conventional brush and digital disk system determines the angle to the nearest degree. The divisions of a degree are measured by a method employing Vernier principles, whereby two signals of the same frequency are generated, but having a phase-difference which increases from zero to 360° as the shaft rotates through one degree. This phase difference is measured with an accuracy of 0.1%, and its value is encoded in digital form. Care is taken to compensate for mechanical defects in the transducers. D.E.Rae

621.317.39

1372 ELECTRONIC SURVEYING. A.S.Rosenthal.
Electronics, Vol. 32, No. 43, 113-15 (Oct. 23, 1959).

Several methods of electronic surveying and map-making are described. These require distance measurements to be far more accurate than those possible with ordinary radar techniques. In the Geodimeter particularly described, visible light (used at night) is passed through a Kerr Cell and reflected back from a distance target. A d.c. reference voltage with an a.c. superposed signal is applied to the cell and modulates the beam passing through. The same a.c. signal is used to power a photo-multiplier tube. The circuit is so designed that the photo-tube is operative only when the modulated light is at zero point. The action of the tube must be synchronized with the light signal. The oscillator operates at 30 Mc/s the resulting quarter-wave being 2.5 m. If the reflector is moved 2.5 m, the photo-tube will still record a null, but moving it a smaller distance makes it necessary to move the photo-tube an equivalent distance for a null reading. A variable electrical delay unit serves the same purpose and this is calibrated to give a direct distance reading. Changing the frequency a few kc/s and again determining the null gives the number of quarter wavelengths in the measured distance. In the Hiran system, aircraft are used as an intrinsic part of the measuring procedure in conjunction with two ground stations. Each ground station is a responder beacon which re-transmits signals from the aircraft. On receiving these back, the airborne equipment interprets the time between the interrogation and response pulse in terms of distance. A new approach in air mapping uses air-carried gravity meters to determine topography. Local changes in the shape of the earth cause changes in gravitational force. The method is much faster but much less accurate. A block schematic and photos of the first method are given and 8 references. B.B.Austin

621.317.39

1373 ON THE ELECTRONIC MEASURING EQUIPMENT OF TECHNICAL ACOUSTICS. W.Bürck.
Frequenz, Vol. 13, No. 11, 343-9 (Nov., 1959). In German.

Describes a large variety of acoustic measuring apparatus for use in research and industry. Examples of the items mentioned are concerned with the indication and/or recording of sound pressure, sound intensity levels, loudness, acceleration and velocity of vibrating surfaces, frequency filters and frequency analysers of various types. The equipment is described with diagrams and photographs. A.B.Wood

621.317.39

1374 THE DYNAMICS OF THE AUDITORY PROCESS AS A FUNCTION OF THE SOUND LEVEL. H.Niese.
Hochfrequenztech. u. ElectroAkust., Vol. 68, No. 5, 143-52 (Dec., 1959). In German.

Discusses the possibility of producing objective noise meters which have a dynamic response more nearly related to that of human hearing and therefore better able to deal with impulsive noises. Recent subjective investigations by Bekesy and others are discussed as well as a new subjective pulse testing technique. Investigations were carried out at various frequencies for sound levels between 30 and 90 dB. The signals used were tone bursts of duration from 10 ms upwards. The subjective auditory response in terms of equivalent loudness is deduced and the approximate equivalent electrical time constant which an objective noise meter requires is estimated. An average time constant of 23 ms is recommended. The statistical errors of measurement obtained are discussed and compared with those published by earlier workers. Circuit arrangements for objective noise meters are discussed. Signals proportional to sound pressure are squared and passed through an RC network with a time constant of 23 ms, a suitable indicating instrument being used. M.L.Gayford

621.317.39

1375 A STROBOSCOPIC VIBRATION ANALYZER. S.Edelman, R.Brooks, S.Saito, E.Jones and E.R.Smith.
J. Res. Nat. Bur. Stand., Vol. 63C, No. 2, 97-103 (Oct.-Dec., 1959).

An instrument for studying the amplitude and phase relations which exist in complex periodic processes such as the vibration of complicated bodies is described. The motion at each point of interest is detected by a vibration pickup. The signal from each pickup is heterodyned with a common signal that differs from the vibration frequency by a small amount to produce a set of signals at the difference frequency. The desired relations are exhibited at the difference frequency which is low enough to give a slow motion effect. The output circuitry allows scope for ingenuity to choose a presentation suited to a particular problem.

621.317.39

1376 THE MEASUREMENT OF VELOCITY, ACCELERATION AND MOMENTUM OF MOVING MACHINE PARTS. H.Renker.
Schweiz. Arch. angew Wiss. Tech., Vol.25, No.10, 381-4 (Oct., 1959). In German.

The movement of the machine part is studied by attaching a strip to it marked off in successive black and white segments. The passage of these segments past a slit is viewed by a photocell connected with a frequency meter and pen recorder. If the strip is wrapped around the perimeter of a machine shaft, the pen recorder plots rotary speed against time and can be used also to record acceleration or deceleration. Two such strips attached on either side of a coupling can be used to record the difference in phase of the rotation and thus record power loss or torque. Although the optical technique is simple and lends itself to tests on almost any form of rotary machine part, tests are also made in which a toothed steel disk is attached to the shaft and the speed of rotation is determined by the passage of the teeth past a magnetic pick-up. A.C.Whiffin

621.317.39

1377 THE MEASUREMENT OF THE BULK FLOW-RATE OF A LIQUID WITH THE AID OF ELECTRICAL CONDUCTIVITY. H.Faltin.

Wiss. Z. Tech. Hochsch. Dresden, Vol. 8, No. 1, 85-90 (1958-59). In German.

A small quantity of electrolyte is injected into the main stream of flow. Two electrodes at a fixed distance sense the passage of the electrolyte cloud and thus provide signals for time interval measurements. This method was considered to be accurate only for high Reynolds-number flows. Careful experiments, using injectors of improved design and different types of electrodes (lattice, grid and needle), were carried out to investigate the accuracy and reliability of the method. The flow was measured in a vertical steel pipe of 26 mm inside dia. with electrodes 3.54 m apart at flow velocities to 120 cm/sec. The test results for flows in both direction indicate that if time interval measurements are made with sufficient accuracy even flows of moderate velocities can be measured accurately. An electronic time interval measurement scheme is described. 8 references. E.Erdélyi

621.317.39

1378 AN IMPEDANCE BRIDGE FOR SURFACE TEMPERATURE MEASUREMENT. R.J.Mouly.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 388-93 (1959) = Commun. and Electronics, No. 44, (Sept., 1959).

The short-comings of previous methods are outlined. The method described permits accurate emissivity-free temperature measurements of the order of 1°C at temperatures up to 500°C. The over-all time of response is about 5 sec but, when balanced, a 5°C per sec rate of change can be followed. The measurements are performed without touching the surface, the temperature of which is to be measured and the output is insensitive to spacing variations of 0.01 inch of the sensing head. The technique is based on the generation of eddy currents in the body whose temperature is to be measured and was primarily developed for the measurement of the temperature of the glass-contacting surface of moulds used for pressing glass objects. These are made of magnetic stainless steel whose resistivity and permeability increase with temperature. The mould is subjected to a sinusoidally varying field and eddy currents are generated which depend on the resistivity, permeability and frequency. Hence if an iron-cored inductor is placed near the mould, its impedance will vary with mould temperature. The instrument must discriminate between changes of the inductor impedance caused by surface temperature changes and those caused by fluctuation of probe to surface spacing and provide an output which is a function of the mould temperature only. The adopted solution is basically an impedance comparison bridge followed by a phase detector. The mathematical solution is given,also a cross-sectional drawing of the probe and a block schematic of the circuit. B.B.Austin

621.317.39 : 621.382

1379 THE DESIGN AND MEASUREMENT OF SEMICONDUCTOR DEVICES IN TERMS OF THERMAL BEHAVIOUR. G.N.Roberts and R.W.A.Scarr.

Proc. Instn Elect. Engrs, Paper 2919 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 409-18, 434-6).

Republication, with discussion, of the paper abstracted in Abstr. 3464 (1959).

621.317.39 : 536.5

1380 A SURVEY OF TEMPERATURE MEASURING TECHNIQUES. W.A.Seatherton.

Brit. Commun. and Electronics, Vol. 6, No. 10, 700-10 (Oct., 1959).

Briefly surveys numerous techniques and a number of charts are included which it is hoped will help the user to select the best type of instrument for a given application.

621.317.39 : 621.398

1381 WAYS TO MEASURE LIGHT INTENSITY AT A DISTANCE. E.F.Hasler and G.Spurr.

Electronics, Vol.32, No.29, 48-9 (July 17, 1959).

621.317.41 : 538

1382 ABSOLUTE METHOD OF MEASURING MAGNETIC SUSCEPTIBILITY. A.Thorpe and F.E.Senftle.

Rev. sci. Instrum., Vol. 30, No. 11, 1006-8 (Nov., 1959).

An absolute method of standardization and measurement of the magnetic susceptibility of small samples is presented which can be applied to most techniques based on the Faraday method. The fact that the susceptibility is a function of the area under the curve of sample displacement v. distance of the magnet from the sample, offers a simple method of measuring the susceptibility without recourse to a standard sample. Typical results on a few substances are compared with reported values, and an error of less than 2% can be achieved.

621.317.43

1383 TESTING ELECTRICAL SHEET. W.B.Crawley.

Elect. Times, Vol. 136, 375-8 (Oct. 15, 1959).

A simple and reasonably inexpensive equipment for the rapid measurement of iron-loss is described. S.A.Ahern

621.317.44 : 538.1

1384 THE MAGNETIC TENSIOMETER AND ITS REALIZATION. R.Bellasio.

Elettrotecnica, Vol. 46, No. 12, 846-52 (Dec. 10, 1959). In Italian.

The term magnetic tensiometer is applied to a device for measuring the magnetic potential between two points in a magnetic field. The instrument comprises a solenoid, long compared to its diameter and a current meter, usually a ballistic galvanometer. Expressions are derived, in terms of the galvanometer constants, for the optimum resistance and turns of the solenoid. It is also shown that, the resistance having been determined, the number of turns may be varied considerably without appreciably affecting the tensiometric constant. W.G.Stripp

621.317.44 : 538

1385 DESIGN OF AUTOMATIC RECORDING INSTRUMENTS FOR MAGNETIC MEASUREMENTS IN A HOT CELL. W.S.Byrnes, R.G.Crawford and R.C.Hall.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 244S-245S (April, 1959).

Two remotely controlled, automatic recording instruments have been designed and constructed for making magnetic measurements in a hot cell: a torque magnetometer for crystal anisotropy measurements and a magnetostrictometer for magnetostriction measurements. The magnetometer automatically plots the torque exerted on a slowly rotating sample as a function of angular displacement with respect to the direction of the applied field. Its sensitivity is 2×10^3 erg/mV. The magnetostrictometer automatically plots strain as a function of applied field. Its maximum sensitivity is 0.2×10^{-6} in./in. mV. Emphasis is placed on design features that enable these instruments to be operated by remote control. In this type of hot cell work, the handling of the samples to be tested requires the use of an expert operator at the manipulator. For this reason tools and jigs are described that compensate for operator inexperience. Such tools are an automatic screw driver, a vacuum pickup, jigs for bonding prewound strain gauges to the samples, etc.

621.317.44 : 538

1386 SHAPE ANISOTROPY IN A WIDE-RANGE GAUSSMETER. F.E.Luborsky and L.I.Mendelsohn.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 248S-249S (April, 1959).

A direct-reading, wide-range, stable gaussmeter is described. It consists of a thin ferromagnetic film mounted on a shaft. This film reacts with a magnetic field to produce a torque whose magnitude is a function of the applied field intensity. The magnetic torque developed is indicated by the angular rotation of the shaft restrained by a spiral spring. Because the magnetic torque is derived from shape anisotropy of the film, the instrument has three most valuable characteristics. First, it cannot be decalibrated by any magnetic field; second, it can cover any useful range from 200 to 20 000 G; finally the gaussmeter can be used for alternating as well as static fields. An analysis of the torque-angle characteristics of this instrument has been made assuming that the magnitude of the film magnetization is uniform and constant and that its direction varies with the field direction and magnitude. Stoner and Wohlfarth's analysis for the ellipsoid which precludes domain boundary formation is used to calculate the anisotropy torque as a function of the applied field. The discrepancies between theory and experiment can be accounted for. Thus, the analysis should prove of interest to those engaged in research on thin films, while the gaussmeter itself has proved a valuable tool for those working with magnetic fields.

621.317.44 : 538.56

1387 NUCLEAR RESONANCE ABSORPTION CIRCUIT. I. SENSITIVITY CONSIDERATIONS. II. PRACTICAL DESIGN. F.N.H.Robinson.

J. sci. Instrum., Vol. 36, No. 12, 481-4, 484-7 (Dec., 1959).

The new circuit described has the sensitivity and flexibility of

conventional circuits using a separate oscillator, combined with the convenience and freedom from microphonics of marginal oscillator circuits. In particular, it permits the use of very low levels of oscillation. The principles and theory of the new circuit are given, as well as practical design details.

621.317.61 : 621.382.333

1388 AN APPARATUS FOR THE MEASUREMENT OF CURRENT GAIN IN THE RANGE 1-300 Mc/s.

H.G.Bassett.

Proc. Instn Elect. Engrs, Paper 2949 E [International Convention on Transistors and Associated Semiconductor Devices] publ. May, 1959 (Part B Suppl. No. 15, 532-5, 567).

Republication, with discussion, of the paper abstracted in Abstr. 3469 (1959).

621.317.61 : 621.382.2

1389 THE MEASUREMENT OF SEMICONDUCTOR DIODE SWITCHING CHARACTERISTICS.

J.N.Barry and S.F.Fisher.

Brit. Commun. and Electronics, Vol. 6, No. 11, 788-91 (Nov., 1959).

A particular test equipment which evaluates the diode in terms of its effective resistance at a pre-selected time after switching is described in some detail.

621.317.61

1390 MEASUREMENT OF THE CONDUCTIVITY OF SEMICONDUCTORS IN THE MICROWAVE RANGE.

B.Kvasil and V.Husa.

Slaboproudy Obzor, Vol. 20, No. 11, 667-71 (1959). In Czech.

A small cylindrical sample of semiconductor material is situated, at the point of maximum electric field, inside a rectangular cavity resonator operating with the TE_{101}-mode at a frequency of about 3000 Mc/s. It is shown that, by measuring resonance frequencies and quality factors of the resonator without and with the sample, sufficient data are obtained for evaluation of the conductivity σ and permittivity ϵ of the sample; the volumes of the resonator and sample should also be known. The method was checked experimentally and was found particularly useful and accurate in the measurement of high-resistance materials ($\rho = \frac{1}{\sigma} > 100\ \Omega$ cm). R.S.Sidorowicz

621.317.61 : 621.382 : 537.311 : 539.2

1391 THE DARK-SPOT METHOD FOR MEASURING THE DIFFUSION CONSTANT AND LENGTH OF EXCESS CHARGE CARRIERS IN SEMICONDUCTORS. A.C.Sim.

Proc. Instn Elect. Engrs, Paper 2997 E [Convention on Transistors and Associated Semiconductor Devices] publ. 1960 (Part B Suppl. No.15, 311-28).

The well known basic method of measuring diffusion length, introduced by Goucher, is here applied in its optimum form. This consists in illuminating the semiconductor surface with interrupted light of uniform intensity and casting shadow whose diameter can be varied. A detector is placed at the centre of the shadow and the variation of signal with the shadow radius can be interpreted theoretically with high precision. The method possesses advantages of circular symmetry, maximum signal strength, simplicity of optical apparatus, and speed of operation. The same apparatus may be employed to measure the diffusion coefficient by using repeated impulses of light, the results giving an exponential law independent of surfaces recombination. Full experimental details and discussion are given, together with a complete mathematical theory which takes into account surface recombination, penetration of photons, boundary effects and shadow effects, and gives a method of measuring the rate of change of diffusion length acrosss the sample surface. A number of experimental results are presented with a tabulated function for their interpretation.

621.317.61

1392 THE DESIGN OF APPARATUS TO MEASURE TRANSISTOR SMALL-SIGNAL PARAMETERS.

M.J.Gay.

Proc. Instn Elect. Engrs, Paper 2956E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 550-4, 567).

Republication, with discussion, of the paper abstracted in Abstr. 3470 (1959).

621.317.61 : 621.382.3

1393 MEASUREMENT OF EQUIVALENT CIRCUIT PARAMETERS OF TRANSISTORS AT V.H.F.

M.B.Das and A.R.Boothroyd.

Proc. Instn Elect. Engrs, Paper 3077 E [Convention on Transistors and Associated Semiconductor Devices] Vol. 106B Suppl. 15, 536-49, 567-70 (1959).

A technique is presented for measuring the current gain of transistors in magnitude and phase under near-short-circuit conditions at frequencies up to some 180 Mc/s. The basic method of measurement involves the determination of three relative voltage magnitudes, from which the magnitude and phase of current gain can be deduced. An important feature of the technique is its simplicity: no specialized equipment is required, signal amplification and voltage magnitude assessment being carried out by means of a standard communication receiver together with a suitable calibrated attenuator and/or indicator. Using the technique of current-gain measurement in conjunction with other measurements, the parameters of the complete high-frequency equivalent circuit of the transistor are determined for diffusion and drift transistors of essentially one-dimensional geometry. In the case of the drift transistor, an important step in this process of measurement is the determination of the base field parameter, m, defined as the ratio of the "built-in" base-region p.d. to the thermal p.d., kT/e. It is shown that m may be deduced from the phase shift of the terminal common-base short-circuit current gain at its 3 dB cut-off frequency, the emitter depletion-layer capacitance having also been measured. Results of equivalent circuit determination are presented for a diffusion transistor and several types of drift transistor, the dependence of the terminal and intrinsic current gains on frequency being shown as polar plots. The properties of the intrinsic current gain of base transport, as deduced from measurements, are compared with the theoretical behaviour assuming for the latter a constant electric field strength throughout the base region for the drift transistors. It is concluded that the commonly used constant-field theory is adequate for analysis purposes in most practical applications of the drift transistors studied, although certain discrepancies are observed between theory and measurement.

621.317.61

1394 A CHARACTERISTIC CURVE TRACER FOR TRANSISTORS. J.Skotnický.

Slaboproudy Obzor, Vol. 20, No. 10, 626-30 (1959). In Slovak.

The device consists of a constant-current generator, a voltage waveform generator, a set of switches and an oscillograph. The current generator produces 7 steps of up to 20 mA each, the steps being repeated at the rate of 100 c/s. The voltage waveform is produced by half-wave rectifying the output of a step-down transformer connected to the mains. The current flowing through the measured transistor is observed across a small resistance connected in series with the voltage source; the resulting signal is used to deflect the beam of the c.r.t. vertically. The half-wave rectified voltage is applied to the horizontal plates. The switches permit the connection of a transistor in various positions, so that a variety of current–voltage curves can be traced. The current-step generator provides a parametric variable, so that a family of current–voltage curves can be displayed. R.S.Sidorowicz

INSTRUMENTS
MEASURING APPARATUS

621.317.7

1395 TAUT-BAND SUSPENSIONS FOR 250-DEGREE INSTRUMENTS.

V.S.Thomander and R.C.MacIndoe.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 379-84 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

The suspended instrument described is a 4½ inch square d.c. moving-coil type for operation with the coil axis horizontal. The length of each suspension strip is 0.4 in., the tension 100 g, the moving system weight 1 g, and the sag 0.002 in. The C-shaped Alnico magnet is magnetized radially, and fits in an external iron ring which forms part of the return flux path. The magnet surrounds a cylindrical iron core, clearance between them forming the single gap in which one side of the eccentrically mounted moving-coil swings. A thin iron strip applied to the inner face of the magnet ensures a uniform flux density in the gap. An iron neck between the core and the external ring completes the magnetic path. The gap density is 2 kG. Two holes in the external ring are fitted with adjustable iron plugs,

and permit adjustment of the total gap flux. A 1 mA instrument has a resistance of 13Ω, and as an ammeter the instrument will operate from 50 mV shunts. The time of response is 1½ sec. It is stated that after being maintained at f.s.d. for 16 hours, the zero creep is only 0.04% of f.s.d. C.F.Pizzey

621.317.71 : 621.384.62 : 537.54

1396 EXTERNAL BEAM CURRENT MONITOR FOR LINEAR ACCELERATORS. L.Bess, J.Ovadia and J.Valassis.
Rev. sci. Instrum. Vol. 30, No. 11, 985-8 (Nov., 1959).

The sensing element of this monitor is a toroidal coil through which the beam passes undisturbed. With appropriate electronic circuitry this permits the true shape of the current pulse to be viewed and also provides an indication of the average beam current on a meter in the range from 3×10^{-9} to 3×10^{-6} A. Furthermore, the use of the current monitor greatly simplifies the process of initially obtaining yield from the machine.

621.317.71/.72

1397 A WIDE-RANGE VOLT-AMPERE CONVERTER FOR CURRENT AND VOLTAGE MEASUREMENTS.
F.L.Hermach and E.S.Williams.
Trans Amer. Inst. Elect. Engrs I, Vol. 78, 384-8 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

The convertor is a 7.5 mA bead-insulated thermocouple with a heater resistance of 66⅔ Ω, and to reduce the effects of ambient temperature variations, it is mounted within a cotton-filled Bakelite cylinder which gives it a thermal time-constant of 40 min. It is operated on the transfer principle. The heater is connected in series with resistors for voltage measurements, and with shunts for current measurements. The couple e.m.f. is manually balanced by an e.m.f. derived from a battery and voltage divider, using a galvanometer as balance indicator. The heater is then switched to a second d.c. sour source which is adjusted to rebalance the galvanometer. The voltage across a part of this circuit is then measured with a d.c. potentiometer, and by multiplying by the appropriate constant, the alternating voltage or current is obtained. For d.c. measurements, the same series resistors and shunts are used, but the thermal convertor is switched out. The apparatus described will measure d.c., and a.c. from 5 c/s to 50 kc/s, with an accuracy of 0.05%.
C.F.Pizzey

621.317.713 : 537.7

1398 LOW-IMPEDANCE ELECTRONIC COULOMETER. J.B.Hudson and F.E.Dickey.
Rev. sci. Instrum., Vol. 30, No. 11, 1020-1 (Nov., 1959).

An electronic coulometer is described which has 15 ohms input impedance, precision of 0.003 C/min, and long time stability of 0.1% of full scale value. Its calibration and testing are described, and means of adapting it to other operating conditions are given.

621.317.72

1399 A PRECISION, CONTINUOUS VOLTAGE REFERENCE FOR INDUSTRIAL RECORDERS. P.B.Robinson.
A.I.E.E. Analog and Digital Instrumentation Conference Paper, p. 43-8. See Abstr. 3875 (1959).

A Zener diode voltage-reference circuit is described which is suitable for replacing the standard cell–dry cell combination now used in the ¼% class of industrial null-balancing recorders. The basic Zener diode works at 7 V where it has a slight positive but reasonably dependable temperature coefficient which is compensated by connecting two additional silicone diodes having negative temperature coefficients in series in the forward direction. This unit, the 1N430, is rated at 8 to 8.8 V and has a dynamic resistance of 15 ohms at 10 mA and a temperature coefficient no greater than ±0.002% per deg C. The dynamic resistance is compensated by connecting the diode in a bridge circuit and the final device supplies 7.5 V at a fixed current of 2 mA within ±0.03% for ±10% line-voltage changes. An appendix gives life-test data on the diodes used.
G.A.Montgomerie

621.317.72

1400 DESIGN AND PERFORMANCE CHARACTERISTICS OF A HIGH-SPEED WIDE-CHART RECORDER.
J.C.Garrigus.
A.I.E.E. Analog and Digital Instrumentation Conference Paper, p. 55-73. See Abstr. 3875 (1959).

The electrical and mechanical design requirements of a high performance recorder are described; the system consists of a potentiometer circuit, d.c. to a.c. chopper converter, input and isolation transformer, electronic amplifier, servomotor, a.c. induction tachometer and feedback network to provide damping, and recording mechanism. The system saturates and provides a maximum torque of 24 oz.-in. when the deviation is 2%; the dead band is less than 0.1%. The dynamic characteristics are also given in various forms, e.g. the time to balance for a full-scale step input is about 0.37 sec. Circuits are given and there is an appendix discussing the mathematical characteristics of the filters.
G.A.Montgomerie

621.317.723

1401 USING FEEDBACK IN ELECTROMETER DESIGN. D.Allenden.
Electronics, Vol. 32, No. 41, 71-3 (Oct. 9, 1959).

Describes an instrument which measures currents in the range 10^{-11} to 10^{-15} amp by passing them through a high-value precision resistor and then amplifying the voltage across the resistor with the direct-coupled amplifier of an electrometer. An accuracy of ±2½% was obtained on the 10^{-14} amp range. V.G.Welsby

621.317.723 : 537.533

1402 LOGARITHMIC CHARACTERISTIC OF TRIODE ELECTROMETER CIRCUITS. S.K.Chao.
Rev. sci. Instrum., Vol.30, No.12, 1087-92 (Dec., 1959).

The triode-connected 5889 electrometer tube was found to be useful as a logarithmic element over a grid current range of 10^{-14} to 10^{-6} A. The relationship of plate current to grid current was carefully studied over a span of three and one-half decades as a function of the plate supply potential, the plate circuit load resistance, and the filament voltage. A circuit was developed for use in an ionization chamber survey instrument. Most 5889 tubes will work in the circuit after a 150 hr ageing period. Overall accuracy of ± 10% of the reading is feasible.

621.317.725

1403 EVOLUTION OF AN X-Y RECORDER. F.H.Wyeth and G.S.Talbot.
A.I.E.E. Analog and Digital Instrumentation Conference Paper, p. 49-54. See Abstr. 3875 (1959).

A description of an X-Y recorder in which the pen moves in one direction and the paper moves at right angles to it. The fundamental voltage range for the paper movement is 0 to 10 mV for 10 in. and this requires 4 sec; the pen-movement standard-voltage range is also 0 to 10 mV and the time of travel for 10 in. is 3 sec or less. In each case the source resistance can vary between a few ohms and 2500 ohms without affecting either the response time or the damping. G.A.Montgomerie

621.317.726

1404 A PEAK VOLTMETER FOR NON-RECURRENT, MOMENTARY PHENOMENA. K.F.Heine.
Elektron. Rdsch., Vol. 13, No. 10, 365-6 (Oct., 1959). In German.

The instrument is based on the familiar principle of charging a capacitor through a rectifier and measuring the voltage across the capacitor. With non-recurrent wave-forms, the charging time of the capacitor must be short compared with the duration of the pulse; also, the rate of discharge must be slow enough to permit the peak voltage indicator to be read. It is shown that short pulses (e.g. 1 μsec duration) cannot be measured with the simple rectifier and capacitor circuit. An arrangement is described which comprises four stages connected in series, each stage consisting of a cathode-follower and a rectifier and capacitor. The input circuit of the cathode-follower of the first stage is connected through a two-way switch to the outputs of a valve phase-inverter so that +ve or –ve pulses can be measured. The discharge time-constant of the capacitor of the fourth stage is 80 sec, and the voltage across it is measured by a bridge-type valve voltmeter incorporating two triodes and a d.c. moving-coil indicator (0-100 μA). A peak voltage of 50 V applied to the input circuit of the phase-inverter gives f.s.d. on the indicator. Accuracy is given as 2% for a 3 μsec pulse. Details are given of a capacitance-compensated, resistive voltage divider for measurement of the triggering voltages of flash tubes. It gives ranges of 0-5 and 0-10 kV, has a resistance of 100 MΩ, and is linear to 3 Mc/s. C.F.Pizzey

621.317.727

1405 REFERENCE SOURCES [USING ZENER DIODES] FOR INDUSTRIAL POTENTIOMETRIC INSTRUMENTS.
G.B.Marson.
Brit. Commun. and Electronics, Vol. 6, No. 10, 688-90 (Oct., 1959).

621.317.73 : 537.311 : 539.2

1406 IMPROVED AUTOMATIC FOUR-POINT RESISTIVITY PROBE. D.Dew-Hughes, A.H.Jones and G.E.Brock.
Rev. sci. Instrum., Vol. 30, No. 10, 920-2 (Oct., 1959).

This continuously recording instrument is a most rapid and convenient means for determining the resistivity profile, and hence the distribution of net extrinsic conduction centres along the length, of a polycrystalline bar or single crystal of semiconductor material. It is the only method available for determining the quality of such material within a very short time of its preparation, and thus is important as a quality-control tool in any semiconductor crystal growing operation. It is severely limited by three factors: (1) it is only a surface measurement, (2) it gives no information about the degree of compensation existing in the material, and (3) it cannot detect the presence of electrically inactive impurities. When combined with more complete characterization of samples cut from a few discrete points along the crystal, it is invaluable as a means of interpolation between these discrete points.

621.317.733

1407 A NEW METHOD OF EARTHING AN ALTERNATING CURRENT WHEATSTONE BRIDGE. B.Karafakioglu.
Ann. Telecomm., Vol. 14, No. 7-8, 157-60 (July-Aug., 1959).
In French.

The bridge is fed from an a.c. source through a transformer with an earthed screen in the usual manner. The balance detector (telephone receiver) is also connected to the bridge through a screened transformer, but a band-pass filter centred on the frequency of the a.c. source is interposed between the detector and the transformer secondary. A second a.c. source of different frequency is connected by a third screened transformer between one supply point of the bridge and earth. A second balance detector with a band-pass filter centred on the frequency of the second a.c. source is provided. By means of a 2-pole 2-way switch, either detector with its filter may be connected to the secondary of the balance detector transformer. Two admittances are connected between the ends of the detector diagonal of the bridge and earth; one of them is adjustable, and by using the appropriate balance detector, the stray capacitances of the bridge may be balanced out. The two frequencies must differ sufficiently to permit signal separation by simple filters, but must be close enough to ensure that the values of the stray admittances are of the same order with either frequency. As an alternative, high-pass and low-pass filters may be used instead of band-pass filters. C.F.Pizzey

621.317.733 : 537.3

1408 WAGNER-EARTH AND OTHER NULL INSTRUMENT CAPACITY NEUTRALIZING CIRCUITS. H.H.Wolff.
Rev. sci. Instrum., Vol. 30, No. 12, 1116-22 (Dec., 1959).

A simple but exact derivation of the conditions for ground potential on the null instrument input in nongrounded a.c. bridges is given. It is shown that not only the "Wagner-Earth", but also other networks and circuits between the power source and the a.c. bridge can easily fulfill these conditions. Advantages of such other networks and circuits are discussed. General considerations for optimum bridge details for measurements of highest obtainable accuracy are given. Practical supply circuits for a.c. bridges are described. Furthermore, it is shown how the adjustment of the earth capacity neutralizing system can be made in a minimum amount of time.

621.317.74

1409 DEVELOPMENT OF A SQUARE-LAW RADIO NOISE METER. I. F.J.Trebby.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 522-8 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

The design of the meter follows the general pattern of a calibrated superheterodyne receiver commonly used for this type of instrument. A departure from the conventional design is the square-law (or r.m.s.) detector, the use of Collins mechanical filter (bandwidth 6.1 or 12 kc/s) for the i.f. amplifier, and the absence of a.v.c. circuits. The advantage of square-law detection is that random-noise average energy can be determined, and this method may result in better correlating between theoretical, laboratory, and field RI data. E.M.Dembinski

621.317.75

1410 A SENSITIVE TRANSISTOR OSCILLOGRAPH WITH D.C. TO 300 Mc/s RESPONSE.
G.B.B.Chaplin, A.R.Owens and A.J.Cole.
Proc. Instn Elect. Engrs, Paper 2943 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 815-23, 840).

Republication, with discussion, of the paper abstracted in Abstr.3490 (1959).

621.317.755

1411 A SIMPLIFIED DISPLAY METHOD FOLLOWING THE RASTER PRINCIPLE. H.R.Bachmann and F.X.Eder.
Exper. Tech. der Phys., Vol. 7, No. 4, 187-91 (1959). In German.

To display random short pulses on a c.r.o. and to photograph the display, sinusoidal line deflection and sawtooth vertical deflection were used. The latter was synchronized with the cinecamera drive. W.G.Stripp

621.317.755 : 537.7

1412 NEW METHOD FOR GRAPHICAL REPRODUCTION OF CATHODE-RAY OSCILLOGRAMS.
R.K.Swank and E.A.Mroz.
Rev. sci Instrum, Vol.30, No.10, 880-4 (Oct., 1959).

An automatic device for tracing the wave form of a repetitive oscilloscope pattern has been developed. The waveform is accurately reproduced and enlarged by a conventional X–Y recorder. Because optical and pulse techniques are used, the system is capable of reproducing signals displayed on even the fastest available oscilloscopes. When used with a h.f. travelling-wave oscilloscope the method is applicable to phenomena in the millimicrosecond region and is capable of utilizing time resolution down to 0.1 mμsec. Deflections as small as 1 μ may be detected. In addition to making oscilloscope measurements faster and more convenient, certain distortions normally encountered in oscilloscopes are obviated.

621.317.755 : 537.7

1413 SAMPLING OSCILLOSCOPE FOR MILLIMICROSECOND PULSES AT A 30 Mc REPETITION RATE.
A.S.Farber.
Rev. sci. Instrum., Vol. 31, No. 1, 15-17 (Jan., 1960).

A sampling oscilloscope with a rise time of 3×10^{-10} sec is described. It may be used with carrier or noncarrier periodic signals having a high fixed repetition rate. A novel coincidence circuit employed in the device for displaying the envelope of 1 mμsec bursts of 10 kMc/s energy is also presented.

621.317.761

1414 THE CONSTRUCTION OF A HIGH-FREQUENCY FREQUENCY METER. H.Hahn.
C.R. Acad. Sci. (Paris), Vol. 249, No. 14, 199-201 (Oct. 5, 1959).
In French.

A frequency meter for the absolute measurement of small frequency fluctuations in the region of 29 625 to 29 635 Mc/s is described. The discriminator system is described and factors governing stability are examined. R.C.Glass

621.317.761

1415 FREQUENCY-METER OPERATING IN THE H_{011} MODE IN THE RANGE 3975-4275 Mc/s. R.L.O.Tattersall.
Post Off. elect. Engrs' J., Vol. 52, No. 2, 129-35 (July, 1959).

A description is given of the design and construction of a cavity frequency-meter having an accuracy of 1 part in 10^5. It is hermetically sealed and has an average Q-factor of 16000. The model described is the prototype for a series of three frequency-meters covering the range 3625-4250 Mc/s in overlapping ranges of 225 Mc/s each.

621.317.772

1416 EXPERIMENTAL EQUIPMENT FOR MEASURING GROUP DELAY IN THE FREQUENCY BAND 3.8-4.2 Gc/s. R.J.Turner.
Post Off. elect. Engrs' J., Vol. 52, No. 3, 207-11 (Oct., 1959).

Equipment is described which measures group delays of up to 50 ns with an accuracy of ±0.2 ns in the frequency range 3.8-4.2 Gc/s. A frequency-modulated Nyquist method is used with a modulation frequency of 1 Mc/s. A heterodyne method with an intermediate frequency of 70 Mc/s is used which enables a point-by-point determination of a group-delay/frequency characteristic to be made.

621.317.773

1417 CIRCUITS FOR DETERMINING THE ORDER OF ROTATION OF THE PHASES IN A THREE PHASE SUPPLY. P.Carré.

Rev. gen. Elect., Vol. 68, No. 9, 527-30 (Sept., 1959). In French.

Describes a simple circuit using three resistors, a capacitor and a neon lamp. The principle of operation is explained and the method of arriving at suitable values for the resistances is set out. Two possible variations on the basic circuit are also shewn. It is claimed that in practice the instrument could be built into a cylinder of 15 mm diameter and 50 mm long, using standard resistances commonly used in radio work. D.R.Way

621.317.75

1418 A POWER LINE TRANSIENT RECORDER. G.H.Hoshall.

A.I.E.E. Analog and Digital Instrumentation Conference Paper, p. 74-9. See Abstr. 3875 (1959).

A magnetic drum provides a delay so that wave forms which exist in a power system immediately prior to, during, and after (for as long as required) the occurrence of a fault may be recorded without the continuous consumption of photographic recording medium. The delay of nearly 1 sec is provided by a 10 in. diameter magnetic drum revolving at 1 rev/sec and the response of the entire unit from the input terminal to the oscillograph record is flat to within ±10% from 45 c/s to 500 c/s and linear to within ±3% of full-scale deflection. G.A.Montgomerie

621.317.784

1419 A CALIBRATION UNIT FOR SINGLE- AND POLYPHASE WATTMETERS. E.Kobel.

Brown Boveri Rev., Vol. 45, No. 11-12, 525-9 (Nov-Dec., 1958)

Describes a unit specially designed for the calibration of single- and polyphase wattmeters at power factors between zero and unity. Factors conducive to errors, which cannot be taken into account by calibration with d.c., can be established by comparison against a standard wattmeter.

621.317.785

1420 POLYPHASE METER CONNECTIONS 30 YEARS AFTER WOODSON. F.W.Warburton.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 398-413 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

An outline is given of the method introduced by W.C.Woodson in 1928 for verifying instrument transformer connections to meters on 3-ph. 3-wire systems. Since that time, the use of 3-ph. 4-wire distribution systems, the growing impractibility of arranging 3-ph. balanced loads for test purposes, and the installation of capacitors and fluorescent lighting, have increased the difficulties in verification. The difficulties, and some examples of wrong connections, and the methods employed to find them, are discussed in detail. It is considered that no new methods have been developed which are adequate for verifying on site the connections of metering equipment for 3-ph. 4-wire loads. C.F.Pizzey

621.317.785

1421 STATISTICAL APPROACHES TO SELECTING DOMESTIC METERS FOR TEST. L.Dwon and J.A.Morris.

Trans. Amer. Inst. Elect. Engrs I, Vol. 78, 413-27 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

Domestic watt-hour meters in The American Electric Power Co. system, which total ~ 440 000, are tested on an 8-year cycle. Past test results show that only 4% of the meters tested were inaccurate beyond the prescribed limits. Improvements in insulating and magnetic materials, particularly the advent of Alnico brake magnets in 1940, make it very probable that 8 years is too short a service period between calibration checks for meters built since 1940, and may be too long for older type meters. Meters have, therefore, been divided into five classes in order of development, the length of service over which accuracy may be expected to be maintained being different for each class. On this basis, two statistical sampling methods of withdrawing meters for check are described, with the object of reducing meter-testing expenses. C.F.Pizzey

621.317.79 : 621.391.812.3

1422 FADING-RATE RECORDER FOR PROPAGATION RESEARCH. J.W.Koch, W.B.Harding and R.J.Jansen.

Electronics, Vol. 32, No. 51, 78-80 (Dec. 18, 1959).

Details are given of the construction and operation of equipment which provides simultaneous strip-chart records of both the strength and average fading rate of received h.f. and v.h.f. signals. The fading rate given by the equipment is the number of times per second that the signal envelope crosses the average signal level with a positive slope, so that this rate may not agree exactly with fading rates as frequently defined, though it does provide a convenient means for comparing average fading rates for various propagation conditions and transmission frequencies. A complete circuit diagram is given of this recorder, which can record fading rates from < 0.5 c/s to 300 c/s at receiver i.f. frequencies from 100 kc/s to 455 kc/s. The recorder has proved quite stable in operation at the Boulder Laboratories of the National Bureau of Standards (where it was developed) after an initial warm-up period of 12 hours, when fed from regulated power supplies. Results obtained with the instrument show that flutter fading at rates up to 20 c/s occur on transmission paths through the auroral zone. Other records show changes in fading rates when rather sudden changes in signal level occur. Caution must be exercised in applying the simultaneous records of signal strength and fading rate directly to communication problems, as the depth of fading and the amplitude distribution of the signal envelope may vary considerably. The recorder gives no indication of the latter factors. A.Wilkinson

621.317.79 : 533.5

1423 SMALL, LIGHTWEIGHT IONIZATION GAUGE CONTROL CIRCUIT. H.B.Benton.

Rev. sci. Instrum., Vol.30, No.10, 887-8 (Oct , 1959)

A lightweight, compact thermionic ionization gauge control is described which is simpler and more efficient than conventional units. Emission regulation is achieved by using a transistorized feedback amplifier to maintain constant emission current in the presence of variations in supply voltage and pressure. Ion current is measured from 10^{-8} to 10^{-4} A, in a single range, using Zener diode as a logarithmic element in the collector circuit.

621.317.79 : 536.33

1424 SIMPLIFIED LOGARITHMIC RADIATION METER USING NOISE. C.E.Cohn.

Rev. sci. Instrum., Vol. 30, No. 12, 1097-9 (Dec., 1959).

A logarithmic radiation meter has been developed which uses an a.c.-coupled logarithmic voltmeter to measure the random noise from a photomultiplier detector. A range of four decades has been obtained.

621.317.79 : 621.376.32 : 621.382

DESIGN AND PERFORMANCE OF A HALL-EFFECT MULTIPLIER. See Abstr. 870

621.317.794 : 621.382

FAST-NEUTRON DOSIMETERS. See Abstr. 871

MAGNETIC DEVICES AND MATERIALS

621.318.1 : 621.374.32

1425 "MAGNISTOR" DEVICES FOR DIGITAL AND LOGIC CIRCUITS.

Elect. Manufng, Vol. 64, No. 2, 74-7 (Aug., 1959).

Describes a new solid-state component which combines a soft magnetic ferrite with a mildly hard ferrite in a multiple-flux-path configuration with the properties of a 1-bit comparator of "half adder less carry".

621.318.1 : 681.142 : 538

1426 REVERSIBLE, DIODELESS, TWISTOR SHIFT REGISTER. A.H.Bobeck and R.F.Fischer.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 43S-44S (April, 1959).

A twistor shift register has been built and operated successfully. The design utilizes interaction effects which exist between magnetized regions on a magnetic wire. Only a single magnetic wire is required for a complete register. The information is stored as magnetically polarized zones which can be moved along the wire by means of a five phase pulse source. No diodes are required. Therefore, drive powers can be greatly decreased since the only threshold consideration is the magnetic material itself. Bi-directional operation is easily secured. The upper frequency limit has not been established;

however, a several hundred kilocycle bit rate should be possible. Physically, the register could be made of no more than magnetic and copper wire. This should make fabrication considerably cheaper than conventional shift registers.

621.318.12 : 681.142 : 538

1427 RECENT ADVANCES IN MAGNETIC DEVICES FOR COMPUTERS. D.H.Looney.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 38S-42S (April, 1959).

Major advances in computer technology have been made by the use of magnetic devices. The speed of operation, storage capacity, and reliability of computers have been significantly increased by the development of the memory core. The present paper describes some of the newer magnetic elements which may replace ferrite toroids in memory matrices. Ferrite materials are being used as sheets, which show great promise in achieving a cost reduction, and as multiaperture devices which in memory applications offer the advantages of increased speeds, a wider operating temperature range, and nondestructive readout. The ferromagnetic materials are used in the form of thin films which are capable of increased switching speeds at nominal current drives. The use of magnetic wire as a storage element offers new fabrication technology, a wider operating temperature range, and new functional structures. A comparison is made to highlight the device characteristics of the various structures.

621.318.12 : 621.374.32 : 539.2 : 538.2

1428 EVALUATION OF NEW HIGH-SPEED MAGNETIC FERRITE SYSTEM FOR USE IN COMPUTER COMPONENTS. B.R.Eichbaum.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 49S-52S (April, 1959).

Present-day computer speeds are limited by the magnetic components utilized in their construction. Such components have been fabricated from square loop ferrites of the $MgO.MnO.Fe_2O_3$ system. Since such materials limit the speed at which the computers can operate, a new ferrite system, namely, the $CdO.MnO.Fe_2O_3$ system, was studied and has been proven feasible for many new high-speed applications. Some of the compositions of this new system exhibiting square hysteresis loops have switching constants as low as 0.200 Oe μsec. Such materials in comparison with those of the $MgO.MnO.Fe_2O_3$ system have a much lower coercive force, require lower driving currents, and have a flux reversal or switching time which is five times as fast. These materials have been used in fast switching multipath elements and matrix switch cores. The operation of such elements is described.

621.318.12 : 621.374.32 : 539.2 : 538.2

1429 REVERSIBLE COMPONENT OF MAGNETIZATION. R.W.McKay.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 56S-57S (April, 1959).

A method of nondestructive sensing of a ferrite-core memory has been suggested which depends on the variation of the reversible component of magnetization with the state of the core. In the work reported here, measurements of this reversible component were made for two types of cores. It was found that the reversible component varies nearly three to one between the remanent state and the demagnetized state. The effects of finite core-wall thickness and of flux-leakage are discussed.

621.318.132 : 539.2 : 538.2

1430 EFFECTS OF HIGH TEMPERATURE ON MAGNETIC PROPERTIES OF CORE MATERIALS. M.Pasnak and R.H.Lundsten.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 107S-108S (April, 1959).

An experimental study was made of the effects of temperature on the d.c. and 60 c/s magnetic properties of the following alloys: Orthonol, 4-79 Mo Permalloy, AEM 4750, L and Z Silectron, Transformer A, Audio Transformer A, 11.7 Alfenol, 15.5 Alfenol, Thermenol, 7-70 Perminvar, and Supermendur. The results indicate that, in general, an increase in temperature decreases the coercive force and the maximum and residual inductions. Maximum and initial permeabilities increase with increasing temperature until the Curie temperature is approached, then they decrease. The initial permeability generally reaches a maximum at a lower temperature than does the maximum permeability.

621.318.2 : 621.316.719 : 538.1

STRONG EDDY-CURRENT APPLICATIONS OF PERMANENT MAGNETS. See Abstr. 1284

621.318.23

1431 PERMANENT MAGNETS FOR INDUSTRIAL APPLICATIONS. L.Boström.

Tekn. T., Vol. 89, No. 43, 1193-7 (Nov. 20, 1959). In Swedish.

New permanent magnets of Alnico with field strengths up to 5 kG now compete with the electromagnet in some applications. They are of special value in the separation of wet materials and in conveyor installations where the absence of supply lines is an advantage. Swedish models weigh up to 10–15 kg, but larger magnets can be assembled from smaller units. Magnets weighing 800 kg are in use in an enrichment plant for nuclear reactors. Designs of horseshoe lifting magnets are discussed, the calculation of forces being explained. The difficulty of estimating leakage fields is pointed out and it is advised that these are best determined with the aid of practical tests. G.N.J.Beck

621.318.3

1432 HIGH MAGNETIC FIELDS FOR ADVANCED RESEARCH. H.H.Kolm.

Electronics, Vol. 32, No. 40, 43-7 (Oct. 2, 1959).

The uses of high magnetic fields in the kilogauss region in various branches of scientific research are discussed. Modern methods of producing pulsed and continuous fields are described and illustrated, and possible future progress outlined. R.C.Glass

621.318.33

1433 CRITERIA FOR COMPARISON AND CHOICE OF ELECTROMAGNETS. I.I.Pekker.

Elektrichestvo, 1959, No.9, 58-61 (Sept.). In Russian.

It is proposed to assess the economy of materials in design of various electromagnets by means of special figures of merit. In these figures of merit, factors determining the design of electromagnets are represented as dimensionless coefficients. It is pointed out that in some cases special considerations are imposed by conditions of operation. Examples are given for calculations of electromagnets on the basis of proposed criteria.

A.Woroncow

621.318.381 : 538.1

1434 ELECTROMAGNETIC SUPPORT ARRANGEMENT WITH THREE-DIMENSIONAL CONTROL. I. THEORETICAL. A.W.Jenkins and H.M.Parker.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 238S-239S (April, 1959).

The original electromagnetic support developed in the late 1930's is a one-dimensional system. Servoed control is obtained in one direction and only inherent stability due to the field shape is obtained in the lateral directions. In this paper the more general problem of a three-dimensionally controlled support is treated theoretically. By virtue of making certain assumptions which seem reasonably close to practical feasibility two basic three-dimensional support schemes have been devised, in which ideally the three mutually perpendicular forces are uncoupled. The two arrangements are described and the theory is applied to predict support performance and to predict the amount of coupling to be expected due to deviations from the ideal system.

621.318.381 : 538.1

1435 ELECTROMAGNETIC SUPPORT ARRANGEMENT WITH THREE-DIMENSIONAL CONTROL. II. EXPERIMENTAL. H.S.Fosque and G.Miller.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 240S-241S (April, 1959).

The first gradient coil configuration described in Part I (see preceding abstract) has been constructed. In this system the axis of one pair of gradient coils is parallel to the magnetizing field. Details of the mechanical, magnetic, optical, and electronic aspects of this implementation are presented and discussed.

INDUCTORS . REACTORS RELAYS

621.318.42

1436 REGIONS OF ABNORMAL OPERATION OF CERTAIN EVEN-ORDER POLYPHASE FERRORESONANT CIRCUITS. M.Panet.
C.R. Acad. Sci. (Paris), Vol. 249, No. 22, 2304-6 (Nov. 30, 1959). In French.

It is shown that, when a star-connected arrangement of an even number of iron-cored choke coils is fed from a polyphase supply, there are certain conditions under which instability may occur. V.G.Welsby

621.318.424

1437 INVESTIGATION OF CONDITIONS IN A BATTERY IGNITION CIRCUIT. M.Drahný and I.Konečný.
Elektrotech. Obzor, Vol. 48, No. 11, 587-91 (1959). In Czech.

The ignition circuit is represented by two inductively coupled LC circuits and the relation for the secondary voltage in the ignition coil V_z, is given. The relation is developed further and the influence of damping is examined semiquantitatively. A quantity, proportional to the maximum of u_z is calculated and is mapped three-dimensionally as a function of the coupling factor of the two LC circuits and as a function of the ratio of natural frequencies of these circuits. A calculated example is given. N.Klein

621.318.424 : 537.3

1438 THEORETICAL AND EXPERIMENTAL ANALYSIS OF THE FERROMAGNETIC EXPLOSIVELY SHOCKED CURRENT PULSE GENERATOR. J.H.Johnson.
J. appl. Phys., Supplement to: Vol. 30, No. 4, 241S-243S (April, 1959).

To most effectively utilize the potential capability of the ferromagnetic explosively actuated current generator one must understand the effect of variation of parameters upon the device output into a given load. Theories of operation of the device, an approximate theoretical analysis of the effect of variation of the basic circuit and device parameters and a comparison of theory with experimental results are given. Theoretical and experimental data are presented and compared for peak current v. circuit load inductance, device load coil turns, and magnetic core width (for a fixed thickness). There is a gratifying similarity between theoretically predicted and experimentally determined data. Guiding criteria are given for an optimum ferromagnetic current pulse generator system.

621.318.424 : 621.314.2

JOINT FACTORS IN STACKED MAGNETIC-CORE DESIGN.
See Abstr. 1211

621.318.43

1439 THE DIFFERENT METHODS OF SWITCHING AND THE IMPEDANCE OF A BISTABLE MAGNETIC CIRCUIT. C.Durante.
C.R. Acad. Sci. (Paris), Vol. 249, No. 20, 2029-30 (Nov. 16, 1959). In French.

Although the behaviour of a ferromagnetic core appears to depend on whether the exciting winding is fed from a voltage source, or a current source, this behaviour can be predicted from the same theoretical formulae. A general expression for the impedance of the circuit is deduced. V.G.Welsby

621.318.5

1440 STATIC RELAYS. H.Lhomme.
Bull. Sci. Assoc. Ingen. Montefiore (A.I.M.), Vol. 72, No. 8, 473-86 (Aug., 1959). In French.

After showing how the various logical elements such as AND, OR and NOT can be used to build up circuits common in industrial contactor-gear practice the Logimag diode/magnetic-core static-switching element is introduced and its use for similar purposes described. Variants and auxiliary devices such as a photoelectric detector, a timer, a high-impedance Logimag, a proximity detector, and a magnetic amplifier are mentioned, and examples of industrial applications are briefly described. G.A.Montgomerie

621.318.5

1441 AN EVALUATION OF THE OPERATING RELIABILITY OF ELECTROMAGNETIC MECHANISMS. Ya.A.Rips.
Elektrichestvo, 1959, No. 8, 57-62 (Aug.). In Russian.

Highly reliable electromagnetic devices generally require a very large number of observations in order to accurately assess their reliability after many working cycles. An alternative method of reliability assessment is presented, yielding a similar accuracy, in which observations are required on comparatively few devices only. Both systematic and sudden failures are taken into account, where the parameters in the reliability criteria are assumed to have normal distribution; the case of distributions which differ from Gaussian is also briefly considered. The method is applied particularly to the electromagnetic relay; here, in a specific example, the reliability after 1.5×10^6 operations is estimated from observations on 100 specimen relays. V.V.Zakharov

621.318.562 : 621.395.344

1442 THE SIEMENS PRECIOUS METAL HIGH-SPEED RELAY AND ITS APPLICATION IN PRIVATE BRANCH EXCHANGES. H.Wilhelm.
Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 18, 429-32 (Sept. 15, 1959). In German.

The relay coil surrounds the centre limb of a transformer type core. To each side of the centre limb is attached a springy armature which carries a short length of silver-palladium wire. The outer limbs carry similar contact springs, with their contact wires at right angles to those on the armatures. The relays are built in banks of five, all independent, each of which may comprise two or three complete relay elements, each with two pairs of contacts. The net force on the armature is increased by the flux from the central limb. The operating time is under 2 ms and the operating ampere turns = 65. Some examples of use in exchanges are given. W.G.Stripp

ELECTROSTATICS . CAPACITORS

621.319 : 539.2 : 537.2 : 77

1443 A REVIEW OF "ELECTROFAX" BEHAVIOR. J.A.Amick.
R.C.A. Rev., Vol.20, No.4, 752-69 (Dec., 1959).

The physical, optical, and electrical properties of Electrofax (See Abstr. 2409 of 1955) layers are reviewed, with special emphasis on the physical model for Electrofax developed by Rose, Gerritsen, and Ruppel. The characteristics of the latent images which can be formed in an Electrofax layer are discussed, together with techniques which can be used to make these latent images visible.

621.319 : 539.2 : 537.2 : 77

1444 A VOLUME-CHARGE CAPACITOR MODEL FOR "ELECTROFAX" LAYERS. J.A.Amick.
R.C.A. Rev., Vol.20, No.4, 770-84 (Dec., 1959).

Observed nonlinearities of the light discharge curves for Electrofax layers are ascribed to ionizable centres uniformly distributed throughout the volume of the dark-adapted layer. When the layers are corona charged, the centres are emptied leaving uncompensated positive charges within the layer. As a result, the charging–discharging characteristics of Electrofax layers are not the same as those for a simple capacitor. By determining the density of ionizable centres present in different Electrofax layers, light-discharge curves can be calculated which agree well with the experimentally observed curves.

621.319.3

1445 OBSERVATIONS ON SECONDARY EMISSION AND ITS OCCURRENCE IN HIGH VOLTAGE GENERATORS. Nguyen-Trinh Dzoanh.
C.R. Acad. Sci. (Paris), Vol. 249, No. 16, 1477-9 (Oct. 19, 1959). In French.

The decrease in the output of certain high-voltage generators as the temperature rises is attributed to secondary emission of reverse polarity ions from insulating surfaces. E.A.Ash

621.319.339

1446 ROTATING ELECTROSTATIC GENERATORS WITH INSULATING CONVEYOR AND OBLIQUE FIELD. Z.Žán.
Elektrotech. Obzor, Vol. 48, No. 11, 580-7 (1959). In Czech.

After discussing some basic aspects of these generators modern types are compared and characteristic design data are tabulated. The comparatively large power obtainable with rotating generators is emphasised. The latter type, with an insulating charge-conveying disk and with an oblique field, is investigated. Relations are derived for the charging of the conveyor, for the transfer of charge, the current of the generator, the voltage of neighbouring poles, the compensation of the field of the conveyed charge and for the power of the generator. N.Klein

621.319.339

1447 AN ELECTRON BEAM GENERATING PLANT FOR STUDIES IN IRRADIATION CHEMISTRY.
M. von Ardenne.
Technik, Vol. 14, No. 10, 674-7 (Oct., 1959). In German.

Describes a pressurized Van de Graaf generator and accelerating tube for producing a beam of 2 MeV electrons for irradiation of materials on an industrial scale. The generator is mounted horizontally to enable it to be placed in a room of normal size. The dosage rate is 1.6×10^7 rad/min. A.E.I.Research Laboratory

621.319.4

1448 CAPACITORS - 1959.
L.Kahn.
I.R.E. Trans. Compon. Parts, Vol. CP-6, No. 3, 150-74 (Sept., 1959).

A general review. Progress since about 1940 is described for the following categories:- paper, plastic film, electrolytic, gas, ceramic, mica and glass capacitors. Trends for the near future are assessed. K.W.Plessner

621.319.4

1449 FUSED-QUARTZ CAPACITOR OF SMALL CAPACITANCE VALUE. M.Kanno and K.Tanaka.
J. Inst. Elect. Commun. Engrs Japan, Vol. 42, No. 9, 844-7 (Sept., 1959). In Japanese.

The type of capacitor described consists of a fused-quartz cylinder with active electrodes plated on the flat ends of the cylinder and a guard electrode plated on nearly the whole curved surface of the cylinder, each electrode having its own soldered lead wire. The capacitance values, measured between the active electrodes with the guard electrode connected to the guard terminal of the measuring equipment, range from 1.0 to 0.001 pF. Measurements at frequencies from 1 to 100 kc/s showed capacitance changes of $<0.1\%$ and the loss angle was always <0.001 radian. The capacitors are provided with a metal shield. Their stability and good electrical characteristics make them suitable for use as standards. A.Wilkinson

621.319.4

1450 CONICAL COAXIAL CAPACITORS AND THEIR ADVANTAGES. M.C.Selby.
J. Res. Nat. Bur. Stand., Vol. 63C, No. 2, 87-9 (Oct.-Dec., 1959).

Adjustable capacitors having electrodes in the form of coaxial cones or frustums have been used on rare occasions in the past, but their potential superiority to other types of capacitors for some important applications has been overlooked. The advantage of this geometry over cylindrical or disk forms is that the practical capacitance range is several times larger. An example cites the capacitance ranges for the same mechanical and percentage accuracy of a disk, cylindrical and conical type to be 10, 40, and 168 to 1, respectively. An approximate equation was derived for this conical capacitor and close agreement is shown between computed and measured values of capacitance versus electrode displacement. Multiple cone and specially shaped electrodes are suggested to obtain large values of capacitance with an appreciable saving of space and further increased range of capacitance.

621.319.4 : 621.317.333

THE INFLUENCE OF INTERNAL DISCHARGE PHENOMENA ON THE DESIGN OF CAPACITOR DIELECTRICS. See Abstr. 1349

621.319.46

1451 CONSTANCY OF THE CAPACITANCE OF COMPRESSED GAS CAPACITORS. A.Keller.
Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 21, 757-61 (Nov. 1, 1959). In German.

The effects of external fields and of inaccuracies in the regulation of the gas pressure of a compressed-air capacitor are found to be negligible. The effects of temperature and of eccentricity of the electrode system can be determined with a high degree of accuracy. The construction of capacitors for 80 and 1400 kV (r.m.s.) is illustrated and described. R.H.Golde

621.319.5 : 621.359.4

1452 FIELD-STRENGTH MEASUREMENTS IN PARALLEL-PLATE PRECIPITATORS. J.S.Lagarias.
Trans Amer. Inst. Elect. Engrs I, Vol. 78, 427-33 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

These were made to determine the field-strength distribution and the effects of dust loading and variation of the spacing of the discharge wires. Field-strengths were determined by dropping steel balls about $\frac{1}{8}$ inch diameter through the precipitator section and measuring the charge acquired. The method was tested against theory using a cylindrical precipitator. Variation of the discharge current influences the field between the wires much more than that directly between wire and plates. Wire spacing had little effect on the current per unit area of plate, but a higher average field-strength was obtained with smaller wire spacings. Field measurements in controlled dust-loaded atmospheres indicated that the dust altered the field-strength by affecting the discharge current. A.E.Kay

621.319.52

1453 RIPPLE AND EFFICIENCY OF VARIOUS CIRCUITS FOR THE ATTAINMENT OF THE HIGHEST D.C. VOLTAGES. G.Wieczorek and H.Stephanides.
Schweiz. Arch. angew. Wiss. Tech., Vol. 25, No. 10, 369-78 (Oct., 1959). In German.

A number of different circuits, including some requiring mechanical switching, are evaluated. It is concluded that the Cockroft–Walton arrangement is preferred, mainly on account of the fact that it can be driven by relatively high frequency sources. E.A.Ash

621.319.74

1454 CONDUCTIVE FLOORING FOR HOSPITAL OPERATING ROOMS.
T.H.Boone, F.L.Hermach, E.H.MacArthur and R.C.McAuliff.
J. Res. Nat. Bur. Stand., Vol. 63C, No. 2, 125-40 (Oct.-Dec., 1959).

Characteristics and performance of available types of conductive flooring materials were investigated in the laboratory. The study showed that the electrodes and instruments used to measure the floor greatly affected the measured resistance, but that the method specified by the National Fire Protection Association (U.S.A.) for measuring the electrical resistance reasonably simulated the conditions under which a floor functions in reducing electrostatic hazards. The physical, chemical and serviceability characteristics of conductive floorings investigated showed results comparable with those of nonconductive flooring of the same type. Consequently, with some limitations, an architect may base his choice of a conductive flooring material on his knowledge of the behaviour of similar nonconductive materials.

LAMPS . ILLUMINATION

621.32

1455 CURRENT PROBLEMS IN AUTOMOBILE LIGHTING. P.Devaux.
Bull. Soc. Franc. Elect., Vol. 9, 575-96 (Oct., 1959). In French.

The first part of the paper is a defence of the French legal requirement for yellow lamps in automobile headlights and refers to various trials which indicate an advantage for yellow light. The second part deals with the standardization of the signalling lights carried on a car, while the third, occupying more than two-thirds of the paper, is a detailed study of the effect of voltage variation on the life and performance of battery lamps. The use of regulators is the only way in which good illumination can be reconciled with satisfactory lamp life. J.W.T.Walsh

621.327.4 : 535.8

1456 HIGH INTENSITY, HIGH SPEED, MULTIFLASH APPARATUS. G.Dixon-Lewis and E.G.Jackson.
J. sci. Instrum., Vol. 36, No. 10, 417-18 (Oct., 1959).

An apparatus has been constructed to provide a number of high-intensity xenon flash discharges at time intervals from 0.1 to 2.5×10^{-4} sec between flashes, each flash dissipating 300 J in approximately 180 msec. Two flash-head arrangements were used: in one, the tubes were mounted on a rotating disk thus giving a series of flashes from one fixed position, whilst the other consisted of a stationary bank of tubes, the location of the individual tubes determining the position of each flash.

621.327.4.212.63 : 537.533

1457 ON THE RESEARCH AND DEVELOPMENT OF ELECTRON EMITTING SUBSTANCES FOR GAS DISCHARGES. D.M.Speros.
J. Electrochem. Soc., Vol. 106, No. 9, 791-9 (Sept., 1959).

Criteria for the stability and chemical behaviour of electron-emitting cathode materials in gas discharges are obtained by means of thermodynamics. Theoretical analysis is supplemented by means of experimental methods intended for the study of processes at elevated temperatures, such a thermogravimetry and differential thermal analysis. The application of the above permits some insight into the processes of formation, activation, and detrition of electron emitting compositions, guiding the development of a number of improved cathodes.

621.327.534.15

1458 MEASURING F[LUORESCENT]-LAMP CHARACTERISTICS FOR THE OUTDOOR ENVIRONMENT. P.R.Herrick and R.E.Wenner.
Illum. Engng, Vol. 54, No. 11, 686-94 (Nov., 1959).

The designer must know the effect of temperature and wind on the performance of a fluorescent-lamp luminaire in order to predict the illumination it will deliver under outdoor conditions. An environmental test chamber for such measurements is described. Proper evaluation of test results in the environmental chamber is outlined by reference to weather data. A simple step-by-step procedure — not requiring an environmental chamber — is presented for estimating performance of a fluorescent-lamp luminaire over a range of outdoor conditions.

621.327.534.15

1459 MEASUREMENT OF CAPACITORS FOR CAPACITIVE CONTROL OF LOW VOLTAGE FLUORESCENT LAMPS. C.H.Sturm.
Lichttechnik, Vol. 11, No. 11, 594-6 (Nov., 1959). In German.

An account of tests applied to capacitors for use with fluorescent lamps in circuits with and without starters. The circuit used for the selection of the reference lamp, and the method of testing the capacitor, using this lamp and a reference ballast, are described. The number of starts to the end of lamp life has been measured for a series of lamps, some used with and some without starters. A frequency distribution curve is given for the watt losses in commercial ballasts. J.W.T.Walsh

621.327.534.25 : 539.2 : 535.37

1460 TRANSLUCENT PHOSPHOR COATINGS IN HIGH-PRESSURE MERCURY-VAPOR LAMPS. C.H.Haake.
J. Electrochem. Soc., Vol. 106, No. 10, 866-70 (Oct., 1959).

The optical conditions in quasi-infinitely thick phosphor plaques and in translucent phosphor coatings of closed lamps are studied. Theory shows, and experiments carried out on magnesium fluorogermanate phosphors activated with Mn confirm, that the correlation between the brightness of plaques and of translucent coatings in closed lamps is rather involved. Although prolonged phosphor firing time monotonically increases the former, the latter reaches a maximum and then decreases. This and other unpredictable results render dubious the value of crude plaque brightness tests of phosphors meant for translucent coatings in lamps. Reliable measurements of phosphors for such coatings must include for the main wavelengths of excitation relative quantum efficiencies, reflectances of quasi-infinitely thick phosphor layers, and also differential reflectivities or absorptivities in a thin phosphor layer of a known density.

628.9

1461 EFFECTIVE INTENSITY OF CERTAIN TYPES OF ROTATING BEACONS. M.R.Wohlers and H.A.Leupp.
Illum. Engng, Vol.54, No.7, 412-14 (July, 1959).

Using the Blondel–Rey law, a good approximation to the effective intensity may be found by assimilating the distribution to that given by $I = I_0 \exp(-K\alpha^2)$ where I is the intensity at an angle α from the direction of the peak value I_0. K is taken as $1/\theta^2$ where θ is the mean of the two values of α for which $I = I_0/e$. The method is applied to three practical distributions and is found to give good agreement with the true values for a wide range of speeds of rotation. J.W.T.Walsh

628.97

1462 ASSESSMENT OF COLOR RENDITION UNDER AN ILLUMINANT USING COLOR TOLERANCES FOR NATURAL OBJECTS. C.L Sanders.
Illum. Engng, Vol. 54, No. 10, 640-6 (Oct., 1959).

Consideration of the colour rendering properties of illuminants and of the methods previously suggested for assessing them indicates the desirability of a more subjective assessment. A procedure is suggested which uses the colour tolerance ellipses obtained by subjective judgments of the colour rendition of several natural objects.

628.97

1463 A METHOD OF ILLUMINATING DIRECTION SIGNS ON MOTORWAYS. V.J.Jehu.
Light and Ltg, Vol. 52, No. 11, 338-40 (Nov., 1959).

Direction signs used on motorways must be large so that they may be easily read by a driver travelling at high speed. A specially designed floodlight for use with tubular fluorescent lamps to illuminate a large sign from ground level is described. Direct light from the lamp illuminates the bottom of the sign, while two sections of reflector illuminate respectively the middle and upper portions. Such units, used on the Preston By-pass, give a luminance of the order of 10 ft-L to white portions of the sign, with a diversity of from 3 to 4.5. J.W.T.Walsh

628.97

1464 LUMINOUS CEILINGS REVIEWED. R.L.C.Tate.
Light and Ltg, Vol. 52, No. 12, 358-65 (Dec., 1959).

Describes first various forms of louvered ceilings and then a number of closed diffuser ceilings. Methods of design involving the use of such ceilings, with particular reference to efficiency, are dealt with and a table of utilization factors is given. Maintenance is very important and the effect on ventilation and heating systems and on fire prevention is discussed. J.W.T.Walsh

628.97

1465 DEVELOPMENT OF A PHYSIOLOGICAL GLARE INDEX CHARACTERISING A LIGHTING FITTING. W.Dittrich.
Lichttechnik, Vol. 12, No. 1, 25-7 (Jan., 1960). In German.

Using the accepted formula for disability glare, the author shows how, for a succession of light sources of known luminous intensity distribution, with uniform height and spacing as in street lighting, it is possible to derive a glare index characteristic of the source. Selecting typical distributions, he finds an index of 3.55 for a dispersive fitting and 0.145 for a concentrating fitting. J.W.T.Walsh

628.97

1466 QUALITY OF STREET LIGHTING. J.B. de Boer.
Lichttechnik, Vol. 11, No. 11, 596-604 (Nov., 1959). In German.

The quality of a street lighting system depends on (a) the general level of brightness, (b) the amount of glare, (c) the brightness of distribution in the field of view, (d) the arrangement of the fittings and (e) the colour of the light. The author examines each of these factors in turn and shows how it contributes to the general impression of ease-of-seeing associated with any given street lighting installation. For streets with heavy traffic the luminance of the street surface should be at least 2 cd/m^2, calling for an illumination of about 3 lm/ft^2, with a satisfactory limitation of glare. J.W.T.Walsh

628.971

1467 FACTORS INVOLVED IN VISUAL PERCEPTION BY PUBLIC LIGHTING. A.Chauchereau.
Bull. Soc. Franc. Elect., Vol. 9, 610-20 (Oct., 1959). In French.

The physical factors are the colour of the light, the formation of shadows by objects on the roadway and the creation of contrasts. The physiological factors are the state of adaptation of the eye, in particular during twilight, and the pattern of the visual field, while the psychological factors include form perception, concentration of interest and distraction, memory and imagination. Each of these matters and its influence on the design of through traffic route lighting is considered separately. The special problems of urban lighting are not dealt with in the paper. J.W.T.Walsh

628.972

1468 ILLUMINATION OF BOILER HOUSES. J.Netušil and J.Polan.
Elektrotech. Obzor, Vol. 48, No. 11, 576-80 (1959). In Czech.

The lighting of boiler houses and auxiliary rooms in power stations is at present generally unsatisfactory; intensities are often low, glare is disturbing and the maintenance of luminaires is difficult. A table of recommended light intensities is given and ways for suitable design of illumination in the different parts of the boiler houses discussed. N.Klein

ELECTROCHEMISTRY

621.351

1469 OXIDES ON THE SILVER ELECTRODE. C.P.Wales and J. Burbank.

J. Electrochem. Soc., Vol. 106, No. 10, 885-90 (Oct., 1959).

Silver electrodes were studied by means of potentials and X-ray diffraction patterns. The silver was charged anodically in 35% KOH by means of either constant current or constant potential, and discharged at a low or high rate. Attempts were made to form an oxide higher than AgO by means of anodization. The products of anodization of silver in 2N H_2SO_4 were determined. The basis for the theory that the oxides of silver are formed by the introduction of oxygen into the octants of the face-centred cubic silver lattice was examined.

621.352.1

1470 TITANIUM AND ZIRCONIUM AS PRIMARY CELL ANODES.

M.A.Thompson, A.B.Scott, D.Chittick and P.M.Gruzensky.

J. Electrochem. Soc., Vol. 106, No. 9, 737-41 (Sept. 1959).

Polarization, chemical corrosion rates, and the anodic electrochemical equivalence for titanium and zirconium were measured in several electrolytes, chiefly fluoride solutions. Titanium exhibited satisfactory electrode characteristics in dilute HF, containing added NH_4F, except for somewhat excessive chemical corrosion. Zirconium was corroded severely by fluoride solutions in which its electrode characteristics were otherwise satisfactory and was somewhat less suitable as an electrode in H_2SO_4 solutions in which chemical corrosion was not serious. The Ti-HF, NH_4F-MnO_2 cell operated stably during discharge with good anode utilization but is probably limited to use as a reserve cell chiefly because of the deleterious effects of fluoride upon the MnO_2 electrode.

621.355.1

1471 RECENT PROGRESS IN SECONDARY BATTERIES. H.J.Mandel, A.Fischbach and A.F.Daniel.

Direct Curr., Vol. 4, No. 6, 177-83 (Sept., 1959).

Detailed information developed over the last 10 to 15 years for four secondary batteries, namely the lead-acid, nickel-cadmium, nickel-zinc and cadmium silver oxide batteries is presented. Constructional improvements, effects of impurities, cell capacities, charging procedures and developments for special purposes, e.g. low and high temperature operation are discussed. 3 tables list types of batteries and their applications. 16 refs.

W.A.Walker

621.355.2

1472 BATTERY IMPEDANCE: FARADS, MILLIOHMS, MICROHENRYS. E.Willihnganz and P.Rohner.

Trans Amer. Elect. Engrs II, Vol. 78, 259-62 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

Gives results of experiments carried out to determine the a.c. resistance of lead acid (lead calcium) type batteries when used for stationary applications. Little information is available on this subject, which is of particular importance to designers of telephone equipment. It is shown that battery impedance includes both inductive and capacitive components. For cells of over 100 Ah, resistance varies almost directly with battery size. Inductance is small at low frequencies and largely independent of battery size, but at high frequencies it becomes the factor which determines total battery impedance. The most striking of the results obtained concerns capacitance, which is relatively very large indeed. At 1 kc/s it is claimed to be 17 000 μF/Ah. It is suggested that this particular battery quality could well be made use of by the circuit designer.

D.R.W.Way

621.357.7 : 621.382.032.27

1473 ELECTROPLATING METAL CONTACTS ON GERMANIUM AND SILICON. D.R.Turner.

J. Electrochem. Soc., Vol. 106, No. 3, 786-90 (Sept., 1959).

Various metals have been plated on germanium and silicon. These semiconductors usually have oxide layers on them which could interfere with the intimate contact required between metal and semiconductor for good adhesion and the desired electrical properties. Oxide films and residues from chemical etching on germanium can be removed by cathodic reduction prior to metal deposition in many plating solutions. Sixteen different metals were plated on n- and p-type germanium. Since oxide films on silicon are difficult to reduce cathodically, other methods of removing the oxide film are employed to produce adherent electrodeposits on silicon.

ELECTRIC HEATING

621.362 : 620.9

1474 THERMOELECTRON ENGINES: FUTURE POWER SOURCES? G.N.Hatsopoulos, J.Welsh and E.Langberg.

Electronics, Vol. 32, No. 46, 69-72 (Nov. 13, 1959).

Reviews the various methods which have been proposed for the direct conversion of heat into electricity at high power levels. Thermoelectric and thermionic methods are considered and the vacuum diode, gas diode and magnetic triode are discussed. A combination thermionic–thermoelectric generator could possibly work with 15% efficiency.

R.C.Glass

621.362 : 621.389

1475 THERMOELECTRIC TEMPERATURE STABILISATION OF ELECTRICAL CIRCUIT ELEMENTS. G.Lautz.

Elektrotech. Z. (E.T.Z.) A, Vol. 80, No. 21, 741-5 (Nov. 1, 1959). In German.

In semiconductor circuit elements such as rectifiers and transistors it is necessary to prevent heating of the components. Some methods of doing so by devices depending on thermoelectric effects are here described.

P.M.Davidson

621.365.55 : 621.315.668.1

THE STERILIZATION OF INSECT-INFESTED WOOD BY HIGH-FREQUENCY HEATING. See Abstr. 1250

621.365.55.029.6 : 621.372.821.2

1476 A MICROWAVE GENERATOR FOR DIELECTRIC HEATING AND DRYING OF NON-METALLIC STRIPS AND SHEETS. W.Schmidt.

Elektron. Rdsch, Vol. 13, No. 10, 359-61 (Oct., 1959). In German.

An H_{01} wave is launched in a folded waveguide which makes eight traverses of the material, at right angles to the direction of travel. The material passes through slits in the x-z faces of the guide and the assembly can be opened up to release the material. To achieve uniform power transfer, the material travels towards the source; the attenuation of the wave at the last section of guide, which the material traverses first, is compensated by the higher loss factor of the damp material. Ventilation is provided by slots in the y-z faces of the guide.

W.G.Stripp

ELECTRIC WAVES AND OSCILLATIONS

LINES . NETWORKS . FILTERS

621.372.2

1477 THE APPLICATION OF THE TWO-DIMENSIONAL LAPLACE TRANSFORM TO ELECTRICAL TRANSMISSION-LINE PROBLEMS. R.Hofmann.
Arch. elekt. Übertragung, Vol. 13, No. 7, 307-12 (July, 1959). In German.

The application of the two-dimensional Laplace transform often produces considerable simplification in calculation. The usefulness of the method is illustrated by reference to a infinite transmission line containing resistance and capacitance only. V.G.Welsby

621.372.2

1478 VOLTAGE DISTRIBUTION ON A TWIN WIRE TRANSMISSION-LINE TERMINATED IN A TIME VARYING RESISTANCE, FOR THE CASE FOR R = G = O. D.Suschowk.
Frequenz, Vol. 13, No. 11, 366-9 (Nov., 1959). In German.

Equations are set up for the voltage distribution, as a function of time, along a transmission line terminated in a time-varying resistance. These equations are solved subject to the restriction that the line is loss-free and that the function representing the terminating resistance is piece-wise differentiable.

A.E.Karbowiak

621.372.2

1479 THE EQUATIONS FOR AN INHOMOGENEOUS CYLINDRICAL-SYMMETRICAL LINE-SYSTEM AND THEIR APPLICATION TO COMPONENT ELEMENTS. H.Heywang.
Frequenz, Vol. 13, No. 12, 397-400 (Dec., 1959). In German.

It is shown that the general solution to the equations involves Bessel and Neumann functions. The results are applied to the calculations of various properties: the skin effect in cylindrical wire; the frequency response of a disk capacitor; the frequency response of a wound capacitor; the apparent resistance of a sintered tantalum capacitor. S.C.Dunn

621.372.2 : 538.56

1480 WAVE PROPAGATION IN A COAXIAL SYSTEM. V.M.Papadopoulos.
Quart. appl. Math., Vol. 17, No. 4, 423-36 (Jan., 1960).

A solution is obtained for the problem of the propagation of electromagnetic waves in a semi-infinite flanged coaxial line with an infinite centre conductor, in terms of an infinite set of coefficients which are determined by an infinite set of linear equations. The solution is discussed, in detail, in limiting cases which illustrate properties both of a thin vertical aerial on a plane perfectly conducting earth, and of a thick aerial fed by a low impedance line. Numerical results are given in these cases, The possibility of a solution for any excitation frequency is also discussed.

621.372.2

1481 THE METHOD OF SIGNAL FLOW GRAPHS. M.Tuero.
Slaboproudy Obzor, Vol.20, No.10, 608-15 (1959). In Czech.

An introduction to the study of signal flow graphs, as applied to the solution of circuit problems. The method of constructing the flow graphs on the basis of linear equations or a system of equations is indicated and basic topological concepts are defined. The so-called residual graph is introduced and its construction is explained. The simplification procedure for the graphs is described, the principal rules being shown in a table. The inversion rule is introduced, and the Mason rule and its application are expounded. The method is illustrated by two numerical examples. R.S.Sidorowicz

621.372.2 : 621.315.2

1482 SYNTHESIS OF CABLE SIMULATION NETWORKS. R.W.DeMonte.
Trans Amer. Inst. Elect. Engrs I, Vol. 78, 682-6 (1959) = Commun. and Electronics, No. 45 (Nov., 1959).

This tutorial paper describes a simple design procedure which permits excellent simulation of cable performance employing a symmetrical lattice network containing a small number of elements. The problem is reduced to one of synthesizing 2-terminal impedances at two frequencies. The design technique is illustrated with applications to three lengths of a particular cable. The performance covering more than 2 decades of frequency shows a design error of less than 0.5% in both real and imaginary parts of the image impedance and propagation constant of the cable. With the aid of loading coils, such networks can be used to simulate the transmission characteristics of any type of loaded cable facility having any fractional length of end section.

621.372.22

1483 A NOTE ON THE OPTIMUM DESIGN OF NON-UNIFORM TRANSMISSION LINES. L.Solymar.
Proc. Instn Elect. Engrs, Monogr. 349E, publ. Nov., 1959, 5 pp. To be republished in Part C.

The optimum design of non-uniform transmission-lines for a given bandwidth is discussed, and it is stated that the shorter the non-uniform transmission line the more violently its characteristic impedance varies. The concept of complexity of this characteristic impedance function is introduced and a design method is suggested for minimizing the complexity. Numerical examples are given to illustrate the method, and it is shown that it is possible to design tapers even shorter than the Chebyshev type. The method is capable of further extension.

621.372.44

1484 GENERALIZATION TO NON-LINEAR NETWORKS OF A THEOREM DUE TO HEAVISIDE. S.Duinker.
Philips Res. Rep., Vol. 14, No. 5, 421-6 (Oct., 1959).

A theorem enunciated by Heaviside and proved by Porentz for linear electromagnetic systems, subjected to a constant electric force which is suddenly impressed, is extended to electrical networks comprising nonlinear reactances and linear dissipances. The theorem states that the amount of work to be done by a constant-voltage source exclusively in favour of the transients bringing the network from the rest state to the steady state, is equal to the excess of the sum of electric energy and co-energy over the sum of magnetic energy and co-energy.

621.372.5

1485 THE RATIONAL CALCULATION OF MULTIPLE MATRIX PRODUCTS. M.Dreikorn and F.Stockinger.
Arch. elekt. Übertragung, Vol. 13, No. 7, 303-6 (July, 1959). In German.

Describes a method of tabulation which facilitates the calculation of the matrix products arising from the mathematical analysis of cascaded networks. V.G.Welsby

621.372.5

1486 TRANSIENT SYNTHESIZER WITH ADJUSTABLE TRANSFER-FUNCTION. P.Eykhoff.
Electronic Technol., Vol. 37, No. 1, 31-6 (Jan., 1960).

Some general considerations and details are given of an instrument primarily built for instructional purposes at lectures on poles and zeros of transfer functions. The instrument offers the possibility of studying the transient response of a quadripole of which the transfer-function in terms of poles and zeros can be set immediately to the desired form. Some future extensions to the existing instrument are mentioned as well as an application for laboratory use.

621.372.5

1487 THE DERIVATION OF POLE–ZERO PATTERNS BY DERIVATIVE ADJUSTMENT.
F.L.Dennis and D.A.Linden.
J. Franklin Inst., Vol. 268, No. 4, 283-93 (Oct., 1959).

The coefficients and pole–zero locations of a transfer function $Z(s)$ containing n poles and m zeros may be determined by imposing a total of $(n + m - 1)$ conditions on the amplitude $A(\omega)$ and the phase $\Phi(\omega)$ of $Z(i\omega)$. In particular, these conditions may be imposed by equating to zero at the origin the first r even derivatives of $A(\omega)$ and the first $(n + m - 1 - r)$ even derivatives of $\Phi'(\omega)$. Two special cases have been treated in the literature, both applying to transfer functions consisting only of poles ($m = 0$). When $r = n - 1$, the sequence of Butterworth patterns is obtained; $r = 0$ corresponds to the maximally linear phase patterns investigated by Thomson (Abstr. 220 of 1953) and Storch [I.R.E. Nat. Convention Record, Vol. 2, Pt 2, 105-17 (1954)]. The general case is studied and is re-

duced to a set of simultaneous equations in the coefficients of Z(s). Closed-form solutions are obtained in a number of special cases. It is shown that for the case m = 0 there exists a third sequence of patterns (in addition to the Butterworth and Thomson functions) in which the second derivative of $A(\omega)$ vanishes at the origin, as do the first (n – 2) even derivatives of $\Phi'(\omega)$.

621.372.5

1488 RESTRICTIONS IMPOSED UPON THE UNIT STEP RESPONSE OF LINEAR PHASE SHIFT NETWORKS. P.M.Chirlian.
Quart. appl. Math., Vol. 17, No. 3, 225-30 (Oct., 1959).

Bounds have been placed upon the 10-90% rise time and overshoot, of the unit step response of phase distortion free networks. Two bounds on the rise time are given, one, in terms of the area under the amplitude function curve, and the other in terms of the area under the square of this curve. Two bounds on the overshoot are given in terms of these areas and the phase slope or its square root. Best possible bounds on the rise time and overshoot are obtained when the amplitude function is itself bounded and approaches zero at least as fast as ω^{-n}, $n > 0$ in the high frequency region. These bounds may be evaluated readily from tabulated data.

621.372.51

1489 IMPEDANCE TRANSFORMATIONS THROUGH LOSSLESS TWO-PORTS REPRESENTED BY FRACTIONAL LINEAR TRANSFORMATIONS OF THE UNIT CIRCLE. K.Jost.
Philips Res. Rep., Vol. 14, No. 4, 301-26 (Aug., 1959).

Any impedance transformation by a lossless two-port network corresponds to an automorphism of the unit circle in the complex reflection-coefficient plane. Such a mapping of the unit circle, determined by three parameters, can always be decomposed into three successive elementary transformations: a rotation about the origin, a hyperbolic transformation corresponding to the impedance transformation by an ideal transformer, and a further rotation about the origin. This decomposition leads to a simple graphical method for the treatment of cascades of lossless two-ports. Cascades giving an ideal transformer are investigated. The determination of the parameters of a two-port (calibration of the two-port) is described.

621.372.54

1490 ON A PROBLEM OF APPROXIMATION OCCURRING IN NETWORK CALCULATIONS. P.Amstutz.
Ann. Telecomm., Vol. 14, No. 5-6, 111-22 (May-June, 1959).
In French.

A method of approximating to Chebyshev characteristics in filters is described. How this may be done is well known where the low-pass filter may be converted into high-pass, band-pass or band-stop filter by a process of frequency transformation. A way of doing this for a more general case is demonstrated. A numerical approximation to a degree of accuracy sufficient for all practical purposes is obtained. T.Horrocks

621.372.54

1491 POWER TRANSFER THROUGH LINEAR QUADRIPOLES. E.Klausmann.
Arch. elekt. Übertragung, Vol. 13, No. 10, 435-42 (Oct., 1959).
In German.

The power transfer is described by three parameters; the source power, the impedance matching ratio and the amplification of the quadripole. It is shown how the relationships between these parameters and the terminating and input impedances of the network can be expressed conveniently in graphical form. V.G.Welsby

621.372.54

1492 ELECTRO-MECHANICAL FILTERS FOR USE IN TELECOMMUNICATION EQUIPMENT. G.L.Grisdale.
Brit. Commun. and Electronics, Vol. 6, No. 11, 768-72 (Nov., 1959).

Four types of filter are described with applications according to the frequency band in which they can be constructed, the bandwidth attainable and the grade of performance required. The types discussed are: reeds, ferrite magnetostriction filters, i.f. bandpass filters and crystal filters.

621.372.54

1493 THE OPTIMIZATION OF A CLASS OF NON-LINEAR FILTERS. J.K.Lubbock.
Proc. Instn Elect. Engrs, Monogr. 344E, publ. Nov., 1959, 15 pp.
To be republished in part C.

An optimum linear filter, in the mean-square-error sense, is no better than the optimum attenuator if there is no dissimilarity between the spectral densities of the signal and the noise. However, non-linear filters can use more statistical information about the signal and noise, so that, although they both possess the same spectral densities, a non-linear filter may be able to introduce a significant improvement in the mean-square error (i.e. it can do better than the optimum attenuator). For this reason the use of a non-linear filter in certain circumstances may well justify the greater difficulties encountered in its optimization and physical realization. The class of filters considered here may be defined by a general expression relating output to input:

$$y(t) = \sum_{r=1}^{R} \int_{0}^{\infty} \omega_r(\tau)\theta_r[x(t-\tau)]d\tau$$

An almost routine procedure is proposed whereby the optimum set of weighting functions, $\omega_r(\tau)$, can be determined given either long enough samples of the combined input and the signal or sufficient statistical information about their characteristics. Some worked examples demonstrate that: (a) A significant improvement in mean-square error is possible even under the condition when the signal and noise possess the same spectral densities. (b) The class of non-linear filters under consideration can be optimized unhindered by the need to evaluate difficult integrals. (c) Although the physical complexity of the filter increases rapidly with the value of R, the mean-square error may converge rapidly to an asymptotic value as R is increased; in one example the performance was found to be within about 5% of the asymptotic value with R = 2.

621.372.54

1494 A THEORETICAL ANALYSIS OF THE TORSIONAL ELECTRO-MECHANICAL FILTERS. W.Struszynski.
Marconi Rev., Vol. 22, 119-43 (3rd Qtr, 1959).

It is shown that there is a strict equivalence between torsional mechanical vibrations in a rod and electrical phenomena in a transmission line. This fact is used to develop a technique for the design of electromechanical filters using rods of varying diameters.
V.G.Welsby

621.372.54

1495 CALCULATION OF THE NORMAL RESPONSE TO A STEP-FUNCTION INPUT FROM THE TRANSFER-FUNCTION. G.Wunsch.
Wiss. Z. Tech. Hochsch. Dresden, Vol. 8, No. 1, 103-6 (1958-59).
In German.

In a method originated by Küpfmuller [Die Systemtheorie der elektrischen Nachrichtenübertragung. Stuttgart: S.Hirzel (1952)] arbitrary assumptions are made first for the attenuation and phase-shift of a linear system with time independent parameters when investigating its transient performance. The influence of these arbitrary assumptions is then examined. This has led often to results that were in contradiction to the causality principle. The paper suggests a generalization of the original method in order to satisfy directly the relationship between attenuation and phase-shift, leading to networks that are physically realizable. Using this generalization and linear two-port network theory it is shown how the response to step function input can be found from the transfer function. E.Erdelyi

621.372 542.21

1496 LADDER NETWORKS AS COUPLING ELEMENTS IN OSCILLATOR CIRCUITS. R.Paul.
Wiss. Z. Tech. Hochsch. Dresden, Vol. 8, No. 4, 829-41 (1958-59).
In German.

The transfer properties of ladder networks are considered by matrix methods with particular reference to their usefulness in self-excited oscillations. A number of tables and graphs are presented giving the location of poles and zeros and also frequency responses. A simple measuring circuit is described and also the results of calculations on circuits containing 3, 4 and 5 meshes. An example is given of a transistor oscillator using a 3-mesh RC ladder network. S.C.Dunn

621.372.543.2

1497 CERAMIC FILTERS AID MINIATURIZATION. A.Lungo.
Electronic Industr., Vol. 18, No. 11, 106-109 (Nov., 1959).

Electromechanical filters are described in which the frequency-sensitive elements are small flat disks of a piezo-electric ceramic (lead-zirconate-titanate). Silver electrodes on both faces of each

disk enable it to be excited in a radial mode. The "ladder" filter is formed by electrically joining several such elements. It is claimed that disks with accurately reproducible characteristic frequencies can be manufactured. They may be used in the frequency range 100–1000 kc/s where their small size and low impedance make them well suited to transistor applications. Most work has been done at 455 kc/s, where a seventeen-element filter has a 6 dB bandwidth of 46 kc/s and a 60 dB bandwidth of 55 kc/s. Input and output impedances are 1500 ohms. The centre frequency changes by ± 0.075% over the temperature range −40% to +85°C. The overall dimensions are $1\frac{1}{2}$ in. long and $\frac{1}{16}$ in. diameter. A.P.C.Thiele

621.372.6 : 621.374.32

1498 SOLUTION TO THE REALIZABILITY PROBLEM FOR IRREDUNDANT BOOLEAN BRANCH-NETWORKS.

L.Lofgren.

J. Franklin Inst., Vol. 268, No. 5, 352-77 (Nov., 1959).

The existence problem for Boolean branch-networks (contact-networks) with only one branch for each different literal of the corresponding Boolean forms is a recognized key-problem for the synthesis of combinatorial (nonoriented) switching circuits. It is equivalent to the topological problem of finding a necessary and sufficient condition for a matrix of integers mod 2 to be a circuit matrix (incidence matrix of a loop-graph). Nor has a simple solution for this problem been given so far. This type of network, called irredundant, is defined for the 2- and n-terminal case and a simple general solution is given to the existence and realizability problem. It is also a solution to the above-mentioned topological problem. This problem is also connected with ordinary circuit theory. The theory of non-oriented networks is readily extended to irredundant networks of oriented branches.

621.372.6

1499 TOPOLOGY AND THE SOLUTION OF LINEAR SYSTEMS. R.B.Ash.

J. Franklin Inst., Vol. 268, No. 6, 453-63 (Dec., 1959).

The concepts of linear graph theory are applied to the study of feedback systems. Two topological matrices, called the exit and entrance matrices, are defined and the transmission matrix of the system is expressed in terms of these matrices. The properties of these matrices are examined, and a relation between nonsingular submatrices and nontouching feedback loops is established. Graph theory and the theory of determinants allow a rigorous proof of Mason's general gain formula. A systematic method, based on the topological formulae derived in the paper, of finding all forward paths and feedback loops without drawing the graph of the feedback system is demonstrated.

621.372.6 : 681.142

INTERCONNECTIONS AND MEASUREMENTS OF TRANSFER FUNCTIONS ON AN ANALOGUE COMPUTER. See Abstr. 1105

621.372.632 : 538.56

1500 STUDY OF A MICROWAVE FERRIMAGNETIC MULTIPLE SIGNAL CONVERSION PROCESS.

E.N.Skomal and M.A.Medina.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 161S-162S (April, 1959).

A multiple signal conversion process has been observed in ferrimagnetic materials at microwave frequencies. The second harmonic of the input frequency is generated in a magnetized ferrite and caused to mix with the fundamental frequency in the specimen generating the harmonic. A portion of the upper side band power arising from mixing of the fundamental frequency and its second harmonic is constructively added to the third harmonic occurring from harmonic generation. The total output power at the third harmonic is consequently increased.

WAVEGUIDES

621.372.8

1501 PROPERTIES AND APPLICATIONS OF THIN METALLIC LAYERS IN THE MICROWAVE RANGE. M.Schneider.

Tech. Mitt. P.T.T., Vol. 37, No. 11, 465-95 (1959). In German.

General discussion of properties and applications of thin metallic films at microwave frequencies is given. The thickness of the metallic layer considered is of the order of skin depth (0.1–10 μ) and various technological processes for deposition of such layers are described. Application of thin metallic layers to the construction of a number of microwave components are described but particular attention is given to directional couplers and detectors. A directional coupler consisting of two rectangular waveguides coupled through an aperture in the common wall covered with thin metallic film is described. The design procedure for such a coupler is given and advantages over conventional designs are claimed, particularly as regards wideband performance. Good agreement between theory and experiment is illustrated by experimental results (X-band) presented in graphical form. Application of thin metallic layers to measurement of microwave power is described in some detail. These are essentially metallic film bolometers of better sensitivity and linearity than conventional designs. A.E.Karbowiak

621.372.821

1502 RADIATION FROM DISCONTINUITIES IN STRIP-LINE. L.Lewin.

Proc. Instn Elect. Engrs, Monogr. 358E, publ. Feb., 1960, 8pp. To be republished in Part C.

A method of calculation, which should be adequate for strip-lines of small spacing, is proposed for the evaluation of the radiation of line-above-ground configurations. It is shown that an open-circuit is appreciably worse, from the point of view of radiation loss, than a short-circuit with a right-angle corner at an intermediate level. The radiation from a matched post is slightly worse than from the short-circuit, but it should be capable of considerable improvement by the use of a terminating frame aerial. Formulae are also given for the effects of reactive posts, with applications to a simple resonator.

621.372.821.2 : 621.365.55.029.6

MICROWAVE GENERATOR FOR DIELECTRIC HEATING AND DRYING OF NON-METALLIC STRIPS AND SHEETS. See Abstr. 1476

621.372.823

1503 A BEND FOR TE_{01} MODE PROPAGATED IN CIRCULAR WAVEGUIDE. P.Marié.

Proc. Instn Elect. Engrs [Convention on Long-distance Transmission by Waveguide], Vol. 106B Suppl. No. 13, 108-9 (1959).

621.372.826

1504 A NOTE ON SURFACE WAVES ALONG CORRUGATED STRUCTURES. L.O.Goldstone and A.A.Oliner.

I.R.E. Trans Antennas and Propagation, Vol. AP-7, No. 3, 274-6 (July, 1959).

An alternative to the analysis published by Hougardy and Hansen (Abstr. 1710 of 1959) is outlined. This is simpler but only accounts for far field effects. It is also pointed out that for uniform structures the oblique propagation characteristics can be obtained directly from the two dimensional case of perpendicular propagation by a wave number transformation. W.T.Blackband

621.372.826

1505 SOME CHARACTERISTICS OF SURFACE-WAVE TRANSMISSION LINES FOR LONG-DISTANCE TRANSMISSION. G.Goubau.

Proc. Instn Elect. Engrs [Convention on Long-Distance Transmission by Waveguide], Vol. 106B Suppl. No. 13, 166-7 (1959).

621.372.83

1506 SOME OBSERVATIONS ON WAVEGUIDE COUPLING THROUGH MEDIUM-SIZED SLOTS. L.Lewin.

Proc. Instn Elect. Engrs, Monogr. 359E, publ. Feb., 1960, 8 pp. To be republished in Part C.

A quasi-static transmission-line method, as used in antenna theory, and modified to take into account effects of radiation damping, is applied to the problem of waveguide coupling through slots which may be large enough to exhibit resonance effects. It is shown that the waveguide environment significantly alters the value to be used for the slot characteristic impedance, although this quantity cannot itself be calculated by the present analysis. The method is applied in detail to the case of axially-coupled waveguides and to guides coupled, via a common broad wall, through crossed slots. It is shown that a narrow slot needs to be very near resonance to give a coupling as large as that from a circular hole of comparable dimensions.

621.372.831.4 : 538.56

1507 HIGH-PRESSURE MICROWAVE WINDOW. A.W.Lawson and G.E.Smith.

Rev. sci. Instrum., Vol. 30, No. 11, 989-91 (Nov., 1959).

Two conically tapered single crystals of Al_2O_3, with small ends abutting, are used to simultaneously effect a high pressure seal and provide a matched transformation from a standard 1 cm circular waveguide at atmospheric pressure to a circular waveguide terminated by a high-Q cavity resonator with an internal hydrostatic pressure up to 10^4 bars.

621.372.832.8 : 538 : 538.56

1508 Y CIRCULATOR. H.N.Chait and T.R.Curry.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 152S-153S (April, 1959).

The field distribution in a rectangular wave guide containing a magnetized ferrite can be asymmetrical even though the physical configuration is symmetrical. By properly choosing the ferrite, its shape, and location, it is possible to concentrate the energy on one side of the wave guide. Reversing the field or changing the direction of propagation will cause the energy to concentrate on the other side of the wave guide. This phenomenon has been utilized to construct a new type of circulator. A ferrite post has been placed at the junction of three wave guides intersecting at 120°. The d.c. field is applied transverse to the broad side of the wave guide. Circulator action can be obtained by using a ferrite rod of the correct size and applying a d.c. field of the proper magnitude. Similar results have been obtained by using single and double slab configurations as well as with wedges. A wave-guide switch can be obtained by reversing the direction of the applied field. Results to date indicate that it is possible to build this Y-type circulator with a loss less than 0.5 dB and isolations and reflections of greater than 20 dB over a 300 Mc/s band at X band.

621.372.832.8 : 539.2 : 538.27 : 538.56

1509 LOW-LOSS GYROMAGNETIC COUPLING THROUGH SINGLE CRYSTAL GARNETS. R.W.DeGrasse.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 155S-156S (April, 1959).

Describes methods of sythesizing filters and gyrators using strong coupling of a small volume of ferrimagnetic material to an electromagnetic circuit. The small volume of material is treated as a lumped element resonator and it is shown that energy can be coupled through this resonator with low loss. The device uses the material for low-loss transmission of microwave energy. The practical realization of devices using this principle depends upon strong coupling of the material to the circuit and the use of "low-loss" materials such as single crystal garnets. The synthesis leads to the design of physically small electronically tunable filters, compact circulators and isolators. Such techniques may also be useful for the realization of low-frequency lumped element devices. Calculations and preliminary tests indicate that devices of this type will lead to the practical realization of solid state TR cells.

621.372.85

1510 RECTANGULAR-WAVEGUIDE LOADS. W.G.Voss.

Electronic Technol., Vol. 37, No. 1, 6-8 (Jan., 1960).

Certain modifications are described to the construction and mounting of resistive-element dissipative strips when used either as a fixed flat load or as an adjustable sliding termination. Results are given of measurements made in S-band but the technique is adaptable to all sizes of rectangular waveguide.

621.372.852.2 : 538.56

1511 THE REGGIA–SPENCER MICROWAVE PHASE SHIFTER. J.A.Weiss.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 153S-154S (April, 1959).

The essential properties of the waveguide phase shifter reported by Reggia and Spencer are explained by means of a composite phenomenological model which incorporates the two dominating effects: the elliptic waveguide symmetry and a dielectric waveguide effect. The model provides an advantageous starting point for more precise calculations, as well as a qualitative guide to further device development. It also sheds further light on Faraday rotation and its associated interference effect under conditions of elliptic symmetry.

621.372.852.22 : 538.56

1512 LIMITATIONS OF ELEMENTARY MODE CONSIDERATIONS IN FERRITE LOADED WAVE GUIDE. R.C.Fletcher and H.Seidel.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 147S-148S (April, 1959).

A consideration of the fundamental TE modes in a wave guide containing a low-loss ferrite slab leads to a mode with a group velocity corresponding to power transfer in a single direction only. A completely reactive isolator, however, is prohibited by general energy conservation principles. Analysis of a rectangular wave guide with a ferrite slab against one wall, showed that there are higher order propagating modes wherever the unidirectional TE mode is cut off. Furthermore, it can be experimentally demonstrated that these modes can be excited from a simple boundary with no variations along the magnetic field. It is suggested that these modes may carry the power when the unidirectional TE mode is cut off. An experimental situation in which the proposed reactive isolator is tried is described. Where the reactive isolator should be cut off and perfectly reflecting, is is highly absorptive. This can be explained by the lossiness of the higher order gyromagnetic modes.

621.372.852.22 : 621.385.64

1513 A DE-COUPLER FOR AN H.F. TRANSMISSION LINE FOR A MICROTRON. H.Reich.

Nuclear Instrum. and Methods, Vol. 3, No. 2, 97-103 (Aug., 1958). In German.

Three types of decoupling elements in the transmission line between magnetron and resonator of a microtron are investigated with respect to their power consumption and efficiency: a shunt resistance, an attenuator pad and a ferrite isolator. The equations governing the v.s.w.r. and the power distribution ratios resonator/load are derived and compared with measurements. It is shown that the shunt resistance rules out the attenuator. The "Uniline" type used here does not give a better power efficiency than the shunt resistance. There only remain the other advantages of a ferrite isolator: ease of installation, uncritical setting of the phase-shifter, and better isolation of the magnetron in the case of flash-over.

621.372.852.223

1514 A RESONANCE ISOLATOR FOR USE AT 4000 Mc/s. A.D.Cartwright and C.F.Davidson.

Post Off. elect. Engrs' J., Vol. 52, Pt 1, 69-73 (April, 1959).

621.372.853.2 : 538.56

1515 HIGH POWER EFFECTS IN FERRITE SLABS AT X BAND. R.L.Martin.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 159S-160S (April, 1959).

Measurements are reported of the attenuation at 9360 Mc/s of full height ferrite slabs in waveguides as a function of ferrite length up to input powers of 120 kW. The ferrites were transversely magnetized to the field for subsidiary resonance. Above the critical power level for the subsidiary resonance the output power was a linear function of the input power with a slope such that the attenuation of that portion of the input power above the critical power was 7.8 dB/in. The phase change through the ferrite region was essentially independent of power.

OSCILLATORS . PULSE GENERATORS

621.373.4

1516 THE BROADENING DUE TO NOISE OF THE SPECTRUM OF AN OSCILLATOR. J.Loeb.

Ann. Telecomm., Vol. 14, No. 5-6, 151-2 (May-June, 1959). In French.

On the assumption of a random noise input in place of a sinusoidal locking function it is shown that the width of the output spectrum is given by

$$\delta\omega_o/\omega_o = nkT\omega_o/8\pi W_i Q^2$$

where n is the noise factor expressed as a power ratio, W_i is the input noise power and the remaining symbols have their usual meanings. W.G.Stripp

621.373.4

1517 A NOTE ON THE NOISE-WIDENED OSCILLATOR SPECTRUM. J.Loeb.

Information and Control, Vol. 1, No. 2, 165-9 (May, 1958).

A formula is derived for the increase in line width of an oscillator resulting from the presence of thermal noise. G.D.Sims

621.373.4

1518 RADIO-FREQUENCY CIRCUITS FOR PLASMA PHYSICS. R.L.Gamblin.
Electronics, Vol. 32, No. 27, 50-2 (July 3, 1959).

The 10 kW 250 kc/s generator described was designed for use with the Stellarator (Project Matterhorn). Its purpose is to effect the initial breakdown of the gas, prior to further heating by other means. The main problems are the adaption to a rapidly varying load, and the need for a rapid rise-time. E.A.Ash

621.373.4

1519 OHMIC HEATING CIRCUITS FOR PLASMA PHYSICS. R.L.Gamblin.
Electronics, Vol. 32, No. 41, 57-9 (Oct. 9, 1959).

The initial heating of the Stellerator plasma is effected by an a.f. pulse. The circuits involved are described in detail. The design is sufficiently flexible to permit operation under a variety of conditions controlled by a feedback system. Typical pulse amplitudes are 6000 A and 200 V. E.A.Ash

621.373.4

1520 THE MICROWAVE-PLASMA TORCH. W.Schmidt.
Elektron. Rdsch., Vol. 13, No. 11, 404-6 (Sept., 1959). In German.

Describes the construction and operation of a plasma-torch for the 2400 ± 50 Mc/s (industrial) frequency band. Rieke diagrams show that the flame should be started on low power, to avoid presenting too high a reflection to the magnetron. A.H.W.Beck

621.373.4

1521 VOLTAGE SENSITIVITY OF LOCAL OSCILLATORS. W.Y.Pan.
R.C.A. Rev., Vol. 20, No. 3, 473-84 (Sept., 1959).

The dependence of the oscillation frequency on certain operating conditions is discussed and defined mathematically in terms of independent variables. The effects of variations in plate and heater voltages on the oscillation frequency are essentially independent of each other. Furthermore, the voltage and warm-up temperature sensitivities of local oscillators are similar in characteristics. These observations suggest an approach to the problem of oscillator stability. When the operating voltages are varied, the oscillation frequency generally exhibits an instantaneous deviation followed by a relatively slow drift. The oscillation device and frequency, circuit configuration, and oscillation strength all have important effects on the voltage sensitivity in most practical local oscillators.

621.373.4 : 621.316.726

1522 SPECTRUM-SELECTION AUTOMATIC FREQUENCY CONTROL OF ULTRA-SHORT-PULSE SIGNALLING SYSTEMS. H.Kihn and R.J.Klensch.
R.C.A.Rev., Vol. 20, No. 3, 499-517 (Sept., 1959).

A system is described which maintains a constant frequency difference between a carrier frequency-modulated by ultra short pulses of 10 mμs duration and a local electrically tuned oscillator. The pulse spectrum distribution is an order of magnitude greater than for existing systems but the circuitry is simple and easily aligned and uses commercially available miniature tubes.

621.373.4

1523 A [CONTRIBUTION TO THE] THEORY OF NON-LINEAR OSCILLATIONS IN RADIO-TECHNIQUES. G.Sh.Kevanishvili.
Radiotekhnika, Vol. 14, No. 9, 17-18 (Sept., 1959). In Russian.

A modification and development of the "slowly-changing amplitudes" method for the solution of differential equations of the type

$$\frac{d^2x}{dt^2} + f\left(x, \frac{dx}{dt}\right) + x = 0$$

is described. P.Collins

621.373.4

1524 OSCILLATION OF A THIRD ORDER NONLINEAR SYSTEM. Chin Yuan-Shun.
Science Record (China), New Series, Vol. 3, No. 6, 209-13 (June, 1959).

The existence, uniqueness and stability of the periodic solution, and also the boundedness of all solutions, is investigated of the nonlinear differential equation of the third order, first studied by Rauch (Oscillation of a third-order nonliner autonomous system. Contributions to the theory of nonlinear Oscillations I, 1950, Princeton University Press). The results are stated in terms of six theorems. S.C.Dunn

621.373.42

1525 A SURVEY OF LOW-FREQUENCY SIGNAL GENERATORS AND OSCILLATORS. R.Brown.
Brit. Commun. and Electronics, Vol. 6, No. 12, 866-7 (Dec., 1959).

621.373.421.11

1526 WIEN BRIDGE OSCILLATORS. THEORETICAL ANALYSIS AND PRACTICAL DESIGN. D.E.D.Hickman.
Wireless Wld, Vol. 65, No. 11, 550-5 (Dec., 1959).

Both the basic equations and normalized expressions for the phase–frequency and amplitude–frequency characteristics of the Wien bridge network are derived. Various sources of frequency drift and errors caused by parameters of the associated amplifier within the regenerative loop are discussed. Various methods of amplitude stabilization are discussed and their limitations pointed out. A design procedure is presented for a low-frequency Wien bridge oscillator employing thermistor stabilization, and the procedure illustrated by a practical example.

621.373.421.13 : 621.317.361

STUDY OF THE VARIATIONS IN QUARTZ FREQUENCY STANDARDS OF THE NATIONAL ELECTRONIC TECHNICAL INSTITUTE. See Abstr. 1361

621.373.421.14

1527 THE GENERATION OF STABLE CARRIER FREQUENCIES IN THE RANGE 3800-4200 Mc/s. R.J.D.Scarbrough, K.H.Ferguson and A.W.Searls.
Post Off. elect. Engrs' J., Vol. 52, Pt 2, 125-8 (July, 1959).

The performance requirements of carrier generators for use with microwave communication systems are briefly considered and a precision-cavity-controlled triode oscillator and a quartz-controlled carrier source are described.

621.373.431.1

1528 FLIP-FLOP CIRCUIT USING SATURATED TRANSISTORS. J.E.Hull.
Electronic Industr., Vol. 18, No. 9, 88-91 (Sept); No. 10, 103-6 (Oct., 1959).

The circuit is a symmetrical emitter-coupled bistable multivibrator. Part 1 deals with the design procedures for the steady-state condition of the circuit. Assuming that the collector and base supply potentials are known together with $I_{c_{max}}$, then the collector load R_L, and the base supply potential divider network R_K and R_B may be found. Parameter variations with temperature changes are accounted for. Part 2 describes the choice of values for speed-up capacitors for various triggering rates and levels. A completed circuit is fully described. J.MacCormack

621.373.431.1

1529 ON THE STABILIZATION OF THE PULSE DURATION IN MONOSTABLE MULTIVIBRATORS. T.Horňák.
Slaboproudy Obzor, Vol.20, No.11, 700-3 (1959). In Slovak.

The pulse-duration stability of a monostable circuit is dependent on the parameters of the valves employed, the supply voltages and the timing constant RC. The effect of valve and supply-voltage variations can be compensated comparatively easily by choosing suitable valves and operating conditions. Instability due to changes of RC can be reduced by introducing a negative feedback system. This is particularly effective when the mark-to-space ratio of the circuit is large. The feedback system is used to stabilize an anode-coupled univibrator. The grid of the pulsing valve is connected to the grid of a pentode with a resistive-capacitive anode circuit. The output of the pentode is connected to the grid of a double-valve cathode-follower whose cathode is joined to the second terminal of C. The action of the pentode results in stabilization of the mark-to-space ratio of the univibrator. The system is suitable as a stable frequency-divider with division ratios of 10 : 1 or higher. R.S.Sidorowicz

621.373.431.2

1530 BLOCKING OSCILLATOR FOR TEN-TO-ONE SYNCHRONIZATION. W.W.Whatley.
Electronics, Vol. 32, No. 48, 58-9 (Nov. 27, 1959).

The synchronization ratio for a conventional blocking oscillator can be increased to 10 : 1 with the stability usually associated with a 1 : 1 ratio. This is achieved by using the incoming trigger pulse

to operate a mono-stable multivibrator to provide a negative bias for an accurately determined time, a multiple of the trigger-repetition rate. If the trigger-repetition period is T and the blocking-oscillator repetition-period is nT then the monostable multivibrator provides an inhibit bias for a period (n-1)T. A complete circuit diagram is included. J.MacCormack

621.373.44

1531 MULTI-WAVEFORM GENERATOR. J.E.Curry.
Electronics, Vol. 32, No. 46, 83 (Nov. 13, 1959).

A concise description is given of a transistor circuit (illustrated) which simultaneously produces triangle, rising and falling saw-tooth, and square waveforms. Two trigger outputs are provided, and the generator can be free-running or externally driven. Amplitude is 10 V peak-to-peak. K.C.Garner

621.373.444

1532 A METHOD OF DESIGNING AVALANCHE TRANSISTOR TRIGGER CIRCUITS. G.B.B.Chaplin and A.R.Owens.
Proc. Instn Elect. Engrs, Paper 2944 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 806-14, 840).

Republication, with discussion, of the paper abstracted in Abstr.3609 (1959).

621.373.51

1533 JUNCTION DIODES AS LIMITERS AND OSCILLATORS M.V.Callendar.
Electronic Radio Engr., Vol. 36, No. 12, 466 (Dec., 1959).

Some experimental data is presented to show that hysteresis loops and even maintained relaxation oscillations in the amplitude of the r.f. signal can occur when a tuned circuit, suitably driven at a fixed r.f., is loaded with a junction diode biased via a CR circuit. The effects are related to the capacitance–voltage characteristics of the diode. F.F.Roberts

621.373.51

1534 A 3000 Mc LUMPED-PARAMETER OSCILLATOR USING AN ESAKI NEGATIVE-RESISTANCE DIODE. R.F.Rutz.
I.B.M. J. Res. Developm., Vol. 3, No. 4, 372-4 (Oct., 1959).

A Sn–As and a Sn–Ga dot are alloyed in close proximity on to a strongly n-type Ge wafer and the tops of the two dots joined together by a Ni shorting bar, the Ge wafer being mounted ohmically on another Ni bar. The Sn–As alloy junction forms a positive resistance and the Sn–Ga alloy junction forms a negative resistance diode, the bars and wafer forming the circuit inductance, and the capacitance of this diode forming the circuit capacitance. The d.c. supply is fed between the bars from a source of at least 1 ohm resistance. The oscillation frequency can be increased by etching away the Ge around the Sn–Ga junction to reduce its capacitance. The oscillator power is a few tens of microwatts. F.F.Roberts

621.373.52

1535 EFFICIENT PHOTOFLASH POWER CONVERTER. R.J.Sherin.
Electronics, Vol. 33, No. 4, 57 (Jan. 22, 1960).

This single-transistor oscillator circuit has high efficiency and uses a Zener diode to stabilize the output voltage. The use of an auxiliary transformer is suggested to give waveform improvements and reduced power consumption.

621.373.52 : 621.314.5

1536 STATIC CONVERTORS USING TRANSISTORS. R.Gosmand.
Rev. tech. C.F.T.H. No. 31, 63-94 (Sept., 1959). In French.

A detailed (mainly analytical) review of the main circuits, waveforms, "iron" and transistor loss characteristics, and of some stabilizing circuits. F.F.Roberts

621.373.52

1537 CRYSTAL CONTROLLED HIGH FREQUENCY TRANSISTOR OSCILLATORS. W.F.Chow.
Semiconductor Prod., Vol. 2, No. 9, 21-7 (Sept., 1959).

Oscillators of 10-50 Mc/s frequency range were studied for their frequency stability with change of supply voltage and of temperature. Good frequency stability can be obtained from a properly designed oscillator without the use of non-linear compensation techniques or the need for any temperature controlled chamber. Experimental results give a frequency change of 3.9 parts per 10^6 per 10% change of supply voltage, and a frequency change of only 0.22 part per 10^6 per deg C of ambient temperature change.

621.373.521.1

1538 FREQUENCY STABILITY OF A TRANSISTORIZED ASTABLE MULTIVIBRATOR. E.Brückner.
Nachrichtentech. Z. (N.T.Z.), Vol. 12, No. 10, 509-13 (Oct., 1959). In German.

A general investigation of frequency stability of astable multivibrators is presented, in relation to transistor characteristics, supply voltage, component tolerances and ambient temperature, both for germanium and silicon transistors. The analysis begins with the voltage–time diagram and the equivalent circuit, leading to formulae for the rate of frequency displacement with supply voltage variation, with transistor characteristics and load resistances as parameters. Similarly, the frequency–temperature dependence is derived and plotted. In both cases experimental measurements agree closely with theory. A brief discussion of desirable temperature coefficients of required resistors and capacitors is included. The investigation is concluded by enumerating desirable transistor characteristics such as low I_{cbo}, high β at large signal levels, and circuit conditions, e.g. high supply rail, optimized collector load resistances, etc. A.Landman

621.373.531.1

1539 PULSE DELAY WITH A MONOSTABLE MULTIVIBRATOR. O.P.Vergili.
Rev. Electrotec., Vol. 65, No. 4, 119-26 (April, 1959). In Spanish.

A detailed description, with circuit and waveform data, of a unit suitable for output pulses from 10 μs to 10 ms length and of 50 c/s to 50 kc/s repetition frequency. Double-triode valves are used. F.F.Roberts

621.373.54

1540 HOW TO GENERATE ACCURATE SAWTOOTH AND PULSE WAVES. C.A.Von Urff and R.W.Ahrons.
Electronics, Vol. 32, No. 50, 64-6 (Dec.11, 1959)

Simple, reliable circuits that generate stable sawtooth and rectangular pulses are given. Output pulse widths, amplitudes and waveform timing are independent of the active elements in the circuit.

621.373.544

1541 A TRANSISTOR LINEAR TIME-BASE CIRCUIT FOR A HIGH CURRENT ELECTROMAGNETIC DEFLECTION SYSTEM. R.C.Bowes and M.E.Piggott.
Proc. Instn Elect. Engrs, Paper 2911 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No.16, 801-5, 840).

Republication, with discussion of the paper abstracted in Abstr. 2937 (1959).

PULSE CIRCUITS . DIGITAL CIRCUITS
SWITCHING CIRCUITS

621.374.3

1542 THE EFFECT OF THE RATE OF RISE OF THE INPUT PULSES ON PULSE TRANSFORMERS. L.Z.Gogolitsyn.
Radiotekhnika, Vol. 14, No. 11, 52-5 (Nov., 1959). In Russian.

Formulae are derived for determining the rise-time and overshoot of the output pulses from the transformer when the input pulse has finite rise-time. Graphs are presented in terms of transformer parameters which could be chosen to give a particular output performance. The equivalent circuit contains only four elements. S.C.Dunn

621.374.32

1543 IMPULSE VOLTAGE WAVES, THEIR CHARACTERISTICS AND THEIR TREATMENT BY EXPONENTIAL CURVES. G.Á.Nagy.
Elektrotechnika, Vol. 52, No. 7, 299-314 (1959). In Hungarian.

The front and tail of impulse waves is represented by exponential curves and the time constants are calculated for various impulses. A treatment is given of the characteristics of the waves, the time constants and the efficiency of a number of basic schemes for generating impulse voltages. The effects of load are discussed and examples are worked out. L.Csuros

621.374.32 : 539.1.07

1544 FAST COINCIDENCES WITH SLOW SCINTILLATORS. F.T.Arecchi.

Energia nucleare, Vol. 6, No. 11, 717-26 (Nov., 1959).

Two different methods for dealing with output pulses from a slow scintillation counter are described. These methods were introduced in order to achieve good time resolution in time measurements. Two devices were designed and their technical features are discussed. Experimental results are compared with theoretical calculations.

621.374.32 : 539.1.07

1545 FAST COINCIDENCE CIRCUIT FOR SLOW PULSES. J.E.Draper and A.A.Fleischer

Rev. sci. Instrum., Vol. 31, No.1, 49-52 (Jan., 1960).

A circuit is described which permits the timing of slow pulses (e.g., 300-mμsec rise time) to good precision (e.g., ±3 mμsec) over a wide range of pulse heights (e.g. 6 V to 120 V) and at high counting rates (average separation > ~ 4 μsec). This is useful particularly in coincidence spectroscopy with NaI(Tl) scintillators.

621.374.32 : 621.375.2 : 539.1.07

1546 A NON OVERLOAD LINEAR AMPLIFIER FOR SCINTILLATION AND PROPORTIONAL COUNTERS. C.Cottini, E.Gatti and E.Zaglio.

Energia nucleare, Vol. 6, No. 9, 588-94 (Sept., 1959).

A high accuracy non-overload amplifier, particularly suited to gamma-ray spectroscopy, is described. Very high counting rates are permissible without distortion of the spectra.

621.374.32

1547 COUNTERS USING SINGLE CRYSTAL BARIUM TITANATE CAPACITORS. T.R.Hoffman.

Semiconductor Prod., Vol. 2, No. 11, 24-6 (Nov., 1959).

A counting circuit of the "staircase" type employs a single-crystal barium titanate capacitor as the key element of the charging circuit and a silicon unijunction transistor as the discharge device. Count ratio can be varied from 1 to over 100, and is independent of input voltage amplitude over wide ranges. Sine waves can be applied directly to the charging circuit. No preliminary wave shaping is necessary.

621.374.32

1548 20 Mc/s SCALING CIRCUIT. B.Collinge and G.B.Huxtable.

Nuclear Instrum. and Methods, Vol. 3, No. 2, 116-18 (Aug., 1958).

A scaling circuit is described which will operate at frequencies greater than 20 Mc/s. Particular attention is paid to reliable triggering. A transistorized version is described in the following abstract.

621.374.32

1549 TRANSISTORIZED COLLINGE–HUXTABLE BINARY CIRCUIT. P.Principi and V.Svelto.

Energia nucleare, Vol. 6, No. 10, 365-6 (Oct., 1959).

See preceding Abstr. A transistorized binary scaler is described using > 7 Mc/s cutoff transistors. A resolution power better than 100 ns is reached for pairs of suitably shaped pulses.

621.374.32

1550 THE CONSTRUCTIONAL PRINCIPLES OF SHAPING CIRCUITS WITH NONHOMOGENEOUS LINES. O.N.Litvinenko and V.I.Soshnikov.

Radiotekhnika i Elektronika, Vol. 4, No. 9, 1448-54 (Sept., 1959). In Russian.

Gives a preliminary mathematical survey of the properties of 2-terminal nonhomogeneous line-shaping networks, the advantages claimed being: (1) the possibility of rectangular pulse shaping on several complex loads as encountered in practice; (2) the possibility of reducing the charge voltage on the open-circuit shaping-line or the charge current on the short-circuit line as compared with homogeneous line-shapers. D.S.Brown

621.374.32

1551 A MULTICHANNEL PULSE AMPLITUDE ANALYSER. P.K.Iyengar, P.N.Rama Rao, G.Venkataraman and K.Usha.

Proc. Indian Acad. Sci. A, Vol. 46, No. 1, 61-71 (July, 1957).

621.374.32 : 531.76

1552 TIME ANALYZER UTILIZING THE ARGONNE TYPE 256-CHANNEL PULSE-HEIGHT ANALYZER. J.F.Whalen, J.W.Meadows and C.H.Nelson.

Rev. sci. Instrum., Vol. 30, No. 11, 991-4 (Nov., 1959).

A time analyser has been designed which is capable of utilizing the memory of any multichannel analyser which employs pulse height to time conversion or any similar instrument. The circuit described has been specifically adapted for use with the Argonne type 256-channel analyser. Channel widths from 1 μsec to > 38 μsec are possible with a minimum dead time of 38 μsec.

621.374.32

1553 TRANSISTOR STOPWATCH. D.E.O'N. Waddington.

Wireless Wld, Vol. 65, No. 10, 521-4 (Nov., 1959).

The principle of operation consists of counting a number of pulses of a known repetition rate during the period to be measured. This instrument uses a free-running transistor multivibrator resulting in an inherent uncertainty error of 0.5% due to the possible mis-counting of one cycle out of the number of cycles representing f.s.d., i.e. 200 pulses/sec. The external run–stop signals operate a bistable transistor circuit which in turn operates a transistor gate allowing the output of the oscillator to be fed to a conventional diode-pump integrator. This uses a battery pentode as a shunt-diode to obtain the desired high impedance. The instrument measures time intervals from 5 sec to 5 msec. J.MacCormack

621.374.32 : 621.373.4

1554 DIGITAL INPUT FOR PRECISION, VARIABLE OSCILLATORS. N.G.Alexakis.

Electronics, Vol. 32, No. 44, 56-7 (Oct. 30, 1959).

A voltage-controlled oscillator supplies the output and also feeds a 4-digit counter. A separate crystal-controlled oscillator and frequency divider produce a 1 sec timing pulse. The desired frequency is set into the counter and if the oscillator frequency is correct the counter generates a 1 sec pulse. Deviations produce constant-amplitude variable-duration pulses which are integrated to give a direct voltage for frequency correction. The oscillator operates between 100 kc/s to 1 Mc/s and the range is extended to 1 c/s by frequency division. W.G.Stripp

621.374.32

1555 MICROWAVE COMPUTER CIRCUITS. F.Leary.

Electronics, Vol. 32, No. 47, 77-81 (Nov. 20, 1959).

A preliminary report of a symposium on microwave techniques for computing systems operating at millimicrosecond rates describes operation of "not", "and" and "carry" circuits utilizing hybrid junctions. A "not" circuit relies on destructive interference at the output terminals of the junction: with stripline ring circuits decreases in output of 23 dB have been achieved. Phase-locked oscillators (called p.l.o's. — a form of parametron) are also described, which behave as memories, by being force-switched to oscillate in either of two phases. At 4 kMc/s they can be switched in 2 cycles. Reading from p.l.o. stores cannot yet be done however without the possibility of altering their memory. Because of the large number of logical circuits required in a computer, the efficient use of stripline and other simplification techniques, such as thin ferromagnetic films, is essential before a practical computer can be made. A.P.C.Thiele

621.374.32 : 681.142

1556 DIGITAL CIRCUITS OPERATING AT 1 Mc/s USING TRANSISTORS. B.D.Simmons and D.M.Bibb.

Proc. Instn Elect. Engrs, Paper 2942 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 688-97, 698-701).

Republication, with discussion, of the paper abstracted in Abstr. 3620 (1959).

621.374.32 : 621.382

1557 HIGH-SPEED DIGITAL-COMPUTER CIRCUITS USING TRANSISTORS AS BIDIRECTIONAL SWITCHES. G.Ord and P.L.Lewis.

Proc. Instn Elect. Engrs, Paper 2985 E [International Convention on Transistors and Associated Semiconductor Devices], publ. 1960 (Part B, Suppl. No. 16, 828-33).

The circuits described use transistors as bidirectional switches

in conjunction with bistable circuits and short delay lines. The bistable circuit is of a type from which registers used in a digital computer may be assembled. By connecting bidirectional switches in various ways between digits of registers, any one of the operations of transfer, exchange, shift and count can be carried out in a time less than 0.2 μs. The transistors used in the bistable circuit and for bidirectional switches are of the surface-barrier type. The delay cable provides a delay of 60 mμs.

621.374.32 : 621.318.56

1558 PRACTICAL METHODS OF SYNTHESIS OF SWITCHING CIRCUITS. Dossogne.

Rev. H.F., Vol. 4, No. 7, 157-69 (1959). In French.

After a brief review of the application of Boolean algebra to switching circuits, including an extension using minus signs to represent contacts connected across relay coils, a method is developed by which generalized circuits such as bridge circuits not reducible to series–parallel networks directly are represented by a connection matrix. Methods are given for reducing such a connection matrix to an algebraic expression representing a series parallel circuit and for deriving a matrix from an algebraic expression. In some cases this can lead to a simpler circuit. The synthesis of a switching circuit consists of three steps: determination of the number of relays; establishing the sequence of operation; and constructing the circuit. These steps are illustrated in detail by working through three problems. G.A.Montgomerie

621.374.32 : 621.382.3

1559 COMPUTING TRANSISTOR SWITCHING DISSIPATION. D.W.Boensel.

Electronics, Vol. 32, No. 48, 74-6 (Nov. 27, 1959).

Outlines, with formulae and nomograms, a method for estimating the total mean dissipation, including the contributions from the turn-on and turn-off transients, due to a repetitive switching waveform. F.F.Roberts.

621.374.32 : 681.142

1560 THE MULTIPURPOSE BIAS DEVICE. II. THE EFFICIENCY OF LOGICAL ELEMENTS.

B.Dunham, D.Middleton, J.H.North, J.A.Sliter and J.W.Weltzien.

I.B.M. J. Res. Developm., Vol. 3, No. 1, 46-53 (Jan., 1959).

For Pt 1 see Abstr. 6243 (1957). The classes of subfunctions realized by biasing inputs of the multipurpose devices described in Pt 1 are studied. A test of relative efficiency or versatility can be based on an assessment of the number of subfunctions generated. A convenient way to label a 4-bit binary number, representing a function, is to allocate to it one of the octal numbers, with or without a prime. The three left binary digits determine the octal number, and the last determines whether it is primed or not. Labels of this kind are given for some of the more familiar functions. Interchange classes, of which the members are equivalent under permutation of input variables, may be represented by the precursor, the member with the smallest label numerically. Using these labels, tables are given of high scoring logical elements, for biasing alone and with duplication of inputs. When this simple scoring leads to identical results for two units, a choice may be made by team scoring, in which all possible non-feedback hook-ups are tested. Some optimum examples are studied and significant properties noted.

W G.Stripp

621.374.32 : 621.318.56

1561 THE PATH MATRIX AND SWITCHING FUNCTIONS. O.Wing and W.H.Kim.

J. Franklin Inst., Vol. 268, No. 4, 251-69 (Oct., 1959).

Pt I introduces a new matrix, the path matrix, in the theory of linear graph. The matrix is defined and its properties are given in a number of lemmas and theorems. They include (1) a relation between the path matrix and the incidence matrix of a connected graph (Theorem 1) and (2) the rank of the path matrix, which is shown to be $e - v + 2 - S$ (Theorem 3), where e is the number of edges, v the number of vertices and S the number of independent circuits contained in the "path-isolated subgraphs" of a connected graph. It is clear that there is a one-to-one correspondence between the union of all paths between two vertices and a two-terminal switching function. An explicit formula is obtained which relates a switching function to the topology of the graph. The formula shows that a switching function is expressible in terms of the path matrix in much the same manner as the determinant of the admittance matrix is expressed in terms of the vertex matrix. Pt II demonstrates a synthesis procedure which obtains a graph from a given path matrix without first converting it into a circuit matrix by means of the "free element" as did Okada, Seshu and Gould. The procedure is based on a number of relations between paths and cut sets, which are derived. As there is a one–one correspondence between a path matrix and a switching function of n variables, the procedure is directly applicable without modification to the synthesis of a switching function of n variables using n contacts.

621.374.32 : 621.318.1 : 538

1562 MILLIMICROSECOND MAGNETIC SWITCHING AND STORAGE ELEMENT. D.A.Meier.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 45S-46S (April, 1959).

A magnetic rod suitable for performing the logical switching and storage functions required in a digital computer has been developed. The magnetic element consists of a silver coated glass rod upon which is electroplated a Fe–Ni alloy several thousand angstroms thick. A single element for a coincident-current memory requiring two inputs, an inhibit winding, and a sense winding would consist of four separate single layer concentric solenoids wound over the magnetic rod. Memory matrices, each consisting of many solenoids, can be stacked and simultaneously threaded with the rod. The switching speed of the element operating in a coincident-current mode is approximately 70 mμsec. The output voltage generated across a ten-turn sense winding is 200 to 500 mV depending upon the alloy thickness. The rod is also suitable as a multi-input logical switch. Separate inhibiting windings wound over the rod perform the NOR function of its input literals. A total of thirty separate inhibiting windings have been demonstrated in the laboratory. Satisfactory operation in the 2 to 5 Mc/s range using transistors in conjunction with the rod has been shown to be practical. Continuous plating and testing in conjunction with automatic machine winding techniques make the rod appear economically attractive in digital computer applications.

621.374.32 : 621.318.12 : 538

1563 MILLIMICROSECOND SWITCHING PROPERTIES OF FERRITE COMPUTER ELEMENTS. W.L.Shevel, Jr.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 47S-48S (April, 1959).

An examination of the switching properties of square loop ferrites is presented. Switching times have been studied over the range 5 μsec to 10 mμsec. The switching parameters, threshold field and switching constant, have been studied as a function of temperature and of ceramic processing. The plot of inverse of switching time against applied fields displays three nearly linear portions for which the slopes vary by a factor of from two to ten. The inverse slope known as the switching constant of the material has therefore three values; this is interpreted as indicating three mechanisms to be responsible for the process of flux reversal, each mechanism being dominant over a certain region of the switching curve. These mechanisms are proposed as being wall motion, incoherent rotation and coherent rotation. A model allowing a coherent rotation process is proposed. Data are presented for several ferrites which have widely varying properties.

621.374.32 : 621.318.12 : 538

1564 STUDY OF THE RESIDUAL STATES OF FERRITE CORES IN COMPUTER MEMORY OPERATION. W.M.Overn and V.J.Korkowski.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 52S-53S (April, 1959).

The two complimentary residual states of magnetic induction used to represent binary information in a ferrite core storage system have been studied. The flux density found at the two states depends on any large fields which may have saturated the core in the past, as well as on the nature of the driving fields employed in the system. The partial-select noise amplitude is a function of the residual magnetic induction and saturation history. By applying this information, "Delta" noise can be eliminated. The role of the post-write disturb pulse in preventing errors under certain abnormal operating conditions has been determined.

621.374.32 : 621.318.1 : 539.2 : 538.2

1565 COINCIDENT-CURRENT NONDESTRUCTIVE READOUT FROM THIN MAGNETIC FILMS. L.J.Oakland and T.D.Rossing.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 54S-55S (April, 1959).

By using cores which consist of two-vacuum-deposited ferromagnetic films it is possible to build memory arrays from which data can be read out nondestructively by use of coincident-current selection. It is thus possible to eliminate the external selection matrices commonly associated with nondestructive readout memories. This system promises to be inexpensive, reliable, and fast,

especially in a memory in which read operations occur more frequently than write operations. Three different devices are described which fulfil the criterion of coincident-current nondestructive readout. Good signal-to-noise has been achieved with each of these.

621.374.32 : 621.318.12 : 538

1566 INHIBITED FLUX — A NEW MODE OF OPERATION OF THE THREE-HOLE MEMORY CORE.

J.A.Baldwin, Jr and J.L.Rogers.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 58S-59S (April, 1959).

A new method of operation of the three-hole memory core has been developed. As is the case with the coincident-flux scheme developed by I.B.M., read and write times may be made very short. However, by using single-line drive rather than coincident current, one need pass but one conductor through each hole. A description is given of a small memory array which uses this method.

621.374.32 : 621.318.1

1567 LONG TIME DELAYS FROM A SINGLE MAGNETIC STORAGE CORE. C.E.Hardies.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 457-61 (1959) = Commun. and Electronics, No. 45 (Nov., 1959).

Magnetic cores with rectangular hysteresis loops and transistor switches are used to produce delays up to 2 min. with an accuracy better than 1%. A series of pulses changes the core flux from one saturation level to the other in discrete steps. Greater delays are, however, obtained if alternate positive and negative pulses of slightly different height are used. Complete flux reversal may then require over 7000 cycles and a 60 c/s source can be used. Various circuits are described for producing unequal pulses, and one gives ½ W power output. R.C.Kell

621.374.32 : 681.142

1568 A TRANSISTORIZED MAGNETIC-CORE STORE. D.Bray and A.Conway.

Proc. Instn Elect. Engrs, Paper 2954 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 644-8, 698-70).

Republication, with discussion, of the paper abstracted in Abstr. 3623 (1959).

621.374.32 : 681.142 : 621.382

1569 A FAST RANDOM-ACCESS DIODE-CAPACITOR STORE USING TRANSISTORS. A.C.Conway.

Proc. Instn Elect. Engrs, Paper 2952 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 657-62, 698-701).

Republication, with discussion, of the paper abstracted in Abstr. 3621 (1959).

621.374.32 : 681.142 : 621.382

1570 TRANSISTOR STORAGE AND LOGIC CIRCUITS FOR BINARY DATA PROCESSING. R.Herman.

Proc. Instn Elect. Engrs, Paper 2958 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 663-74, 698-701).

Republication, with discussion, of the paper abstracted in Abstr. 3261 (1959).

621.374.32 : 621.318.57 : 621.383.2

1571 HIGH-SPEED LIGHT OUTPUT SIGNALS FROM ELECTROLUMINESCENT STORAGE SYSTEMS.

G.R.Hoffman, D.H.Smith and D.C.Jeffreys.

Proc. Instn Elect. Engrs, Paper 3217M, publ. Feb., 1960. To be republished in Vol. 108B (1960).

The possibility that a matrix of electroluminescent cells could be used for storage of information in digital form has long been realized. The problems involved in reading information from a simple type of permanent store are discussed. It has been shown that the read-out time is limited by the afterglow of the phosphor, and, for a particular (ZnS, Cu, Cl) phosphor, it is 25-30 microsec per digit. A theoretical calculation of the discrimination ratio, i.e. the ratio of the output signal from a "1" to the interference signal obtained when a "0" is selected, shows that it should be possible to operate matrices with as many as 64^3 cells. This conclusion is not borne out by measurements made on experimental panels; these suggest that 32^3 is about the maximum. Results obtained in the paper are regarded as preliminary since arbitrary choices have had to be made concerning some aspects of the operation of the matrices. There is little doubt that considerable improvement in performance is possible.

621.374.32 : 621.318.5

1572 THE APPLICATION OF A PATTERN-RECOGNITION TECHNIQUE TO THE SYNTHESIS OF CODING CIRCUITS.

J.H.Calderwood and A.Porter.

J. Electronics and Control, Vol. 6, No. 6, 556-66 (June, 1959).

If the patterns which characterize the topology of the switching functions associated with coding processes are regular and predictable, the corresponding translating circuits can be readily determined. To exemplify the technique a pattern-recognition method is applied to the synthesis of circuits for (a) the translation of binary numbers into the Gray Code (also referred to as the reflected binary and continuous progressive code) and vice versa, and (b) the generation of the Hamming self-correcting code.

621.374.32 : 621.318.5

1573 THE SYNTHESIS OF A PARALLEL ADDER CIRCUIT USING A PATTERN-RECOGNITION TECHNIQUE.

J.H.Calderwood and A.Porter.

J. Electronics and Control, Vol. 6, No. 6, 567-76 (June, 1959).

The topology of the switching function table has been examined directly and, by use of a pattern-recognition technique, an adder-circuit has been synthesized. A comparison is made between a conventional adder circuit and the circuit derived directly from the topology of the switching function patterns.

621.374.32

1574 ANALYSIS OF TRANSISTOR-RESISTOR-LOGIC CIRCUIT PROPAGATION DELAY.

W.J.Dunnet, E.P.Auger and A.C.Scott.

Sylvania Technol., Vol. 12, No. 4, 123-33 (Oct., 1959).

A programme to design transistor-resistor-logic (T.R.L.) circuits and compile T.R.L. propagation delay tables on a digital computer is described. The need for such a programme is discussed and transistor and T.R.L. circuit studies that have resulted in the basic relationships being programmed are also described. The criterion of T.R.L. circuit performance is taken to be signal propagation delay. This delay can be predicted by applying the expressions of Ebers and Moll (see Abstr. 937 of 1955) for the large-signal transient response of transistors. The accuracy and usefulness of these expressions are increased by measuring pertinent transistor parameters under large-signal transient conditions and by considering the practical case in which propagated signals have finite — rather than step — rise, and decay times.

621.374.32 : 621.382.32

THE TRANSISTOR SWITCH—A SOLID-STATE POWER RELAY. See Abstr. 886

621.374.32 : 621.382.333.3

P-N-II-N TRIODE SWITCHING APPLICATIONS. See Abstr. 889

621.374.32 : 621.318.12 : 539.2 : 538.2

EVALUATION OF NEW HIGH-SPEED MAGNETIC FERRITE SYSTEM FOR USE IN COMPUTER COMPONENTS. See Abstr. 1428

621.374.32 : 621.372.6

SOLUTION TO THE REALIZABILITY PROBLEM FOR IRREDUNDANT BOOLEAN BRANCH-NETWORKS. See Abstr. 1498

621.374.32 : 621.318.12 : 539.2 : 538.2

REVERSIBLE COMPONENT OF MAGNETIZATION. See Abstr. 1429

621.374.35 : 539.1.07

1575 MILLIMICROSECOND DISCRIMINATOR. D.F.Swift and V.Perez-Mendez.

Rev. sci. Instrum., Vol. 30, No. 11, 1004-6 (Nov., 1959).

A discriminator circuit for use with millimicrosecond counting equipment is described. The circuit utilizes a diode voltage comparator which drives a secondary-emission tube univibrator after amplification. Two shaped outputs are provided: one, of short duration, for use with 10 Mc/s scalers, and another longer pulse for microsecond scalers. The main characteristics of this unit are its good response to pulses as short as 3 mμsec and the fast recovery time, which is less than 0.1 μsec at the fast output.

621.374.4

1576 DERIVATION OF A MULTIPLE OF A VARIABLE FREQUENCY. V.Gavreau and A.Calaora.

C.R. Acad. Sci. (Paris), Vol. 249, No. 20, 2026-8 (Nov. 16, 1959). In French.

A method of frequency multiplication uses a c.r.t. whose screen is covered by an opaque mask. An aperture is cut in the mask whose height h varies across the diameter of the c.r.t. in accordance with the equations $x = A \cos\theta$ and $h = E \cos n\theta$; n being the value by which the input frequency f is to be multiplied. A vertical line of light is generated on the screen the horizontal position of which is controlled at any time by the voltage applied to the X plates. When a voltage of frequency f is applied to the X plates the quantity of light transmitted to a photocell through the aperture in the mask varies sinusoidally at frequency nf. D.E.Rae

621.374.4 : 539.1.07

1577 TIME-TO-PULSE HEIGHT CONVERTER OF WIDE RANGE. J.Fischer and A.Lundby.

Rev. sci. Instrum., Vol. 31, No. 1, 10-14 (Jan., 1960).

A time-to-pulse height converter covering the range from millimicroseconds to minutes is described. A simple 5-component passive circuit for scanning times above 50 μsec is included also. The converters can measure several events per time scan related to one starting event. They are designed as plug-in units for an oscilloscope, and utilize its sweep and other circuits. The use of the converters is discussed and includes scanning of negative time and inverted operation for reduction of counting losses. Notes on testing, calibration, and dead times are given, as well as examples of nuclear experiments to which they have been applied.

621.374.4 : 621.382.23

1578 FREQUENCY MULTIPLICATION AND DIVISION BY SEMICONDUCTOR DIODES AT MICROWAVE FREQUENCIES. D.Leenov and A.Uhlir, Jr.

Semiconductor Prod., Vol. 2, No. 10, 25-8 (Oct., 1959).

Semiconductor diodes offer unique advantages as harmonic generators, because of their small size and low power requirements. These devices may be used to generate significant amounts of power at microwave and even millimetre wave frequencies. A new semiconductor device, the p–n junction nonlinear capacitor diode, is described. A theoretical discussion is included to show that this device should be a considerably more efficient harmonic generator than the point-contact diode, a semiconductor device of long standing. Examples of harmonic-generation yields obtained with nonlinear capacitance diodes are given to illustrate the superiority of these devices.

621.374.44

1579 USING DIGITAL TECHNIQUES IN TIME ENCODERS. R.J.Sullivan, I.Eastman and I.C.Chanock.

Electronics, Vol. 32, No. 46, 80-2 (Nov. 13, 1959).

This encoder generates a serial set of decimal-coded pulses every 20 ms for recording as time markers on magnetic tape records. A.O.Stanesby

621.374.44

1580 DISPLACEMENT CALIBRATION DURING THE RECORDING OF A SINUSOIDAL MOVEMENT. G.Hodgson and J.McKenzie.

Instrum. Pract., Vol. 13, No. 9, 917-21 (Sept., 1959).

An account is given of a stroke calibration unit, consisting of a photo-transistor pick-up and a pulse generator, which was developed and constructed at the laboratory for applying pulses, of equal displacement intervals, to a sinusoidal stroke trace of an extrusion test record. The separate units are described and a full explanation of their operation is given. Other possible applications of the unit are discussed, the pulse generator having been designed with this in view.

621.374.44

1581 AN ELECTRONIC GENERATOR OF RANDOM SEQUENCES. J.Havel.

Slaboproudy Obzor, Vol.20, No.12, 735-40 (1959). In Czech.

The generator consists of a primary source producing trains of randomly-spaced identical pulses and a converting device which produces a binary random process having the probability of 1/2. The primary source employs a photo-electric cell as a noise generator; this is followed by an amplifier having a bandwidth of 140 kc/s –4 Mc/s, an amplitude discriminator and a cathode-follower. The amplifier and discriminator produce an "infinite" clipping of the noise waveform, so that a sequence of rectangular pulses is obtained. The edges of the pulses correspond to zero crossings of the noise waveform. The pulses are then differentiated and "pips" corresponding to negative edges are taken as the primary random pulse trains. The resulting signal is applied to a balanced scale-of two which is controlled by a gating circuit. The gate is opened periodically for 994 μs and closed for 6 μs. During the closing period the state of the scale-of-two is examined. Depending on whether the number of pulses during 994 μs is even or odd, output pulses are produced in two lines referred to as "1" and "0". In this way a random binary process is produced. Before the commencement of the next sampling interval, the scale-of-two is reset to zero. R.S.Sidorowicz

621.374.5

1582 A NEW LINEAR DELAY CIRCUIT BASED ON AN EMITTER-COUPLED MULTIVIBRATOR. R.C.Bowes.

Proc. Instn Elect. Engrs, Paper 2951 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No.16, 793-800, 840).

Republication, with discussion, of the paper abstracted in Abstr. 3636 (1959).

621.374.5 : 621.374.32 : 681.142

1583 TRANSISTORIZED CENTRAL PULSE GENERATOR FOR DIGITAL EQUIPMENT. D.J.Grover and J.M.C.Dukes.

Proc. Instn Elect. Engrs, Paper 2893 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 824-7, 840).

Republication, with discussion, of the paper abstracted in Abstr.2961 (1959).

AMPLIFIERS

(Abstracts on magnetic amplifiers appear also under Inductors . Reactors)

621.375.2

1584 REDUCING AMPLIFIER DISTORTION. G.W.Holbrook.

Electronic Technol., Vol. 37, No. 1, 13-20 (Jan., 1960).

Describes a general method of correcting the non-linear distortion in valve amplifiers by means of non-linear resistors. A variable-loss network composed of non-linear and linear resistors can be designed to have a transfer characteristic approximately complementary to that of an amplifier. A tandem combination of the network and amplifier produces an overall transfer characteristic which is significantly more linear than the original. A method for determining the curvature of the transfer characteristic of an amplifier is described and the selection and design of appropriate non-linear networks are discussed. Illustrative examples of corrected single-ended and push-pull amplifiers are described. An example of the use of this method in conjunction with conventional negative feedback is also illustrated. A discussion of the effects of temperature coefficient and self-capacitance of non-linear resistors is included.

621.375.2

1585 A THREE-CHANNEL STEREOPHONIC SOUND REINFORCEMENT MIXING CONSOLE. P.C.Erhorn.

J. Audio Engng Soc., Vol. 7, No. 4, 223-7 (Oct., 1959).

A self-contained unit is described, designed for either stereo or multichannel monophonic coverage of large public or private gatherings. The design includes many features which make the work of the operator less complicated. Pushbutton switching flexibility of all inputs, and outputs, plus unusual emergency facilities afford a completely versatile console with no obvious limitations for future applications.

621.375.2/.4

1586 POCKET PAGERS. L.E.Philipps.

J. Audio Engr Soc., Vol. 7, No. 4, 235-8, 245 (Oct., 1959).

Various types of systems are described in general terms and one, an audio induction system, is described in detail. A new method of paging is described, comparing its effectiveness with conventional methods. Simplified schematic-block diagrams are given.

621.375.221

1587 AN AUTO-TRANSFORMER HIGH FREQUENCY COMPENSATING CIRCUIT FOR A RESISTANCE LOADED VALVE AMPLIFIER. V.P.Shasherin.

Radiotekhnika, Vol. 14, No. 11, 13-20 (Nov., 1959). In Russian.

The various proposals which have been made for correcting video amplifiers are reviewed. It is pointed out that the advantages of some of them can only be realized if there is some control over the relative values of the stray capacitances. In practice this control is absent and a circuit is proposed in which a variable mutual inductance enables the best use to be made of the existing capacitance ratio. In effect the connection of the next stage is taken from a tap on the compensating coil which is connected between the anode and the anode load. The transient performance of the circuit is evaluated and it is shown to be superior to certain 5th and 6th order circuits which have previously been proposed. S.C.Dunn

621.375.222 : 621.317.31

1588 DIRECT-COUPLED AMPLIFIER FOR THE MEASUREMENT OF SMALL CURRENTS. B.R.F.Kendall.

Nuclear Instrum. and Methods, Vol. 3, No. 2, 73-9 (Aug., 1958).

Methods for the reduction of grid current noise and leakage currents in direct-coupled preamplifier circuits are discussed. It is shown that, by combining a cathode-follower preamplifier with a negative-feedback output circuit, input grid resistors of very high value can be used. The construction and performance of an amplifier using these principles is described. Features of this circuit are a high zero-stability and an adjustable time-constant.

621.375.227

1589 A NOVEL ASYMMETRIC PUSH-PULL AMPLIFIER WITH EXTREMELY SMALL INTERNAL RESISTANCE. H.Völz.

Elektron. Rdsch., Vol. 13, No. 7, 242-4 (July, 1959). In German.

A single-ended two-valve amplifier with mixed feedback is modified by the addition of a second output valve, driven directly by the same input signal. Operation is described and optimal parameters are formulated. A.Reiss

621.375.3

1590 A TRANSISTOR-MAGNETIC AMPLIFIER. O.A.Kossov.

Avotomat. i Telemekh., Vol. 20, No. 7, 988-91 (1959). In Russian.

A simple transistor-magnetic amplifier with switching transistors at its output is described. The experimental model gave an output power of 170 watts and employed two semi-conductor triodes without auxiliary heat dissipators. The amplifier operated from 45 V, 50 c/s supply. The power gain was 1.5×10^5. P.Collins

621.375.3

1591 MAGNETIC AMPLIFIERS. P.Ringlet.

Bull. Sci. Assoc. Ingen. Montefiore (A.I.M.), Vol. 72, No. 8, 489-520 (Aug., 1959). In French.

The historical reasons for the late development on magnetic amplifiers are given and also a brief account of the specific inventions which have led to the present state of the art. The descriptive diagrams and circuits of all the simple types of amplifier are presented with qualitative explanations. A number of examples are shown including a voltage stabilizer, a controller for electrolytic processes, a conveyor-belt servo, a rolling-mill controller and a strip-mill brake. S.C.Dunn

621.375.3

1592 THE USE OF A PUSH-PULL MAGNETIC AMPLIFIER AS A MEASURING ELEMENT FOR HIGH DIRECT CURRENT IN CONTROL SYSTEMS. O.N.Mel'nikov.

Elektrichestvo, 1959, No. 8, 36-40 (Aug.). In Russian.

The basic difficulty in using a magnetic amplifier for providing feedback from the armature current of a large d.c. motor is in providing sensitivity to current direction. Circuits with bias, separate and overall feedback are examined briefly and the effective time-constants evaluated for the cases of instantaneous change in current value and for a linear increase with time. No experimental work is reported. S.C.Dunn

621.375.3

1593 HIGH-GAIN MAGNETIC AMPLIFIER IN BRIDGE CIRCUIT. S.D.Warner.

Elect. Manufng, Vol. 64, No. 3, 114-16, 117 (Sept., 1959).

Description of a magnetic amplifier consisting of four windings (two each on two coils) connected in a bridge. It has high gain at high temperatures, since only one low-rated rectifier is required. Design parameters and calculations are given.

621.375.3

1594 GRAPHICAL EVALUATION OF MAGNETIC AMPLIFIER PERFORMANCE BASED ON CONSTANT-VOLTAGE RESET TEST. D.Nitzan.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 891-98 (1959) = Commun. and Electronics, No. 45 (Nov., 1959).

A half-wave voltage-reset magnetic amplifier with a switching transistor in the control circuit is used as a core tester. Families of magnetizing current v. the magnitude of induced voltage with reset flux as a parameter are recorded A graphical construction similar to the conventional one in the design of electronic amplifiers can yield the core behaviour when operating in a 2-core magnetic amplifier, regardless of the magnitude of the control resistance.

621.375.4

1595 HOW TO DESIGN A VIDEO AMPLIFIER WITH A 30 Mc BANDWIDTH. W.A.Zins.

Electronic Industr., Vol. 18, No. 9, 84-7 (Sept., 1959).

A detailed description of a four stage video amplifier of 30 Mc/s bandwidth and 40 dB voltage gain is given. Four 3N25 grown-diffused germanium tetrode transistors are used in common-emitter configuration, the fifth, in the output stage, being an emitter-follower. The stabilizing and frequency compensating circuits, apart from conventional series and shunt peaking coils, consist of two types of feedback arrangement; emitter degenerative series feedback and second-stage emitter to first-stage base feedback which is a series network of R, C and L. This latter feedback circuit is repeated across the 3rd and 4th stages. A.Landman

621.375.4

1596 TRANSISTOR MATCHING IMPEDANCES. A.G.Bogle.

Electronic Technol., Vol. 37, No. 1, 28-30 (Jan., 1960).

Calculations and measurements are described, relating to the variation of input impedance, output impedance and gain of an OC71 transistor with operating point and with negative feedback. If a gain reduction from optimum of 6 dB is permissible, the input and output impedances may be raised to 3.6 kΩ and 54 kΩ respectively with series feedback, or reduced to 420 Ω and 4.5 kΩ respectively by choice of operating point.

621.375.4

1597 A TRANSISTOR PREAMPLIFIER DESIGN FOR MAGNETIC PICKUPS. H.J.Paz.

J. Audio Engng Soc., Vol. 5, No. 4, 208-14 (Oct., 1959).

Describes the design and performance of a transistor preamplifier equalizer for magnetic pickups for use in broadcast studios. It can be used with low-impedance magnetic of high-impedance variable reluctance type cartridges. The preamplifier uses three transistors and employs a feedback equalization which provides optimum response between 50 to 15 000 c/s. The basic design equations for the transistor feedback equalizer are derived. The preamplifier can deliver an output level of −20 dB to a 150 ohm load, with less than 1% harmonic distortion. The use of the 2N175 low noise transistor in the input stage results in a high signal-to-noise ratio. A three-position switch is provided for adjustment of the high-frequency response of the equalizer in accordance with the preference of the user. Alternating current line power is used to insure continuous operation. Etched wiring boards are used for automatic production and product uniformity. The preamplifier is designed to be mounted to the top of a studio turntable.

621.375.4

1598 A TRANSISTOR HEARING AID. H.Thwaite and E.Aspinall.

Post Off. elect. Engrs' J., Vol. 52, Pt 3, 163-9 (Oct., 1959).

A hearing aid suitable for use by young children, in which the microphone, amplifier and single-cell battery are contained in one case is described. The total weight, including the earphone, is 3¼ oz. A modification, using a pick-up coil which enables the aid to be used with inductive-loop installations in schools, is also mentioned.

621.375.4 : 621.395.44

1599 INTERMODULATION DISTORTION IN AN EXPERIMENTAL GROUP AMPLIFIER USING TRANSISTORS. D.H.Jones.

Proc. Instn Elect. Engrs, Paper 2878 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 472-80, 529-31).

Republication, with discussion, of the paper abstracted in Abstr. 2976 (1959).

621.375.4

1600 NON-LINEAR DISTORTION IN TRANSISTOR CLASS-A AMPLIFIERS AT LOW AND MEDIUM FREQUENCIES. N.I.Meyer.
Proc. Instn Elect. Engrs, Paper 2896 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 481-9, 529-31).
Republication, with discussion, of the paper abstracted in Abstr. 3655 (1959).

621.375.4

1601 STABILITY CONDITIONS IN TUNED COMMON-EMITTER TRANSISTOR AMPLIFIERS. G.Phylip-Jones.
Proc. Instn Elect. Engrs, Paper 3053E [International Convention on Transistors and Associated Semiconductor Devices], publ. 1959 (Vol. 106B Suppl. No. 15, 505-17).
Some of the important factors which determine the stability of common-emitter tuned amplifiers are discussed. It is shown that the the minimum value of feedback capacitance required to produce instability depends on the number of stages in the amplifier and that it varies appreciably with the phase shift in the transistor. In any particular case two values are obtained corresponding to whether the circuit is under- or over-neutralized, and these values define the boundaries of the stability region. At frequencies very much lower than the α-cut-off frequency of the transistor, these two limits are equal in magnitude, but as the frequency is increased there is an increasing difference between them. In practice these two limits are made sufficiently large so that component and transistor variations do not greatly affect the stability of the amplifier. It is shown, however, that variations from the perfectly neutralized condition may still produce considerable distortion in the amplifier frequency-response if the actual feedback capacitance is greater than about 20% of the values required for oscillation.

621.375.4 : 621.376.332

1602 A HIGH-PERFORMANCE 100 kc/s AMPLIFIER AND DISCRIMINATOR. J.Willis and C.C.Richardson.
Proc. Instn Elect. Engrs, Paper 2988E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 780-8, 789-92).
Republication, with discussion, of the paper abstracted in Abstr. 3656 (1959).

621.375.4 : 537.7

1603 TRANSISTORIZED DISTRIBUTED AMPLIFIER. C.W.McMullen.
Rev. sci. Instrum., Vol. 30, No. 12, 1109-13 (Dec., 1959).
Some analytical and experimental results are given for a transistorized distributed amplifier using the common emitter configuration. The characteristic impedances of the base and collector transmission lines are both 43.4Ω. A 4-section amplifier stage yields a mid-frequency gain of 5.1 dB and an upper half-power frequency of 290 Mc/s. The low-frequency response is reasonably constant down to 10 c/s.

621.375.4

1604 NON-LINEAR DISTORTION IN SEMICONDUCTOR TRIODE AMPLIFIERS USING AUTOMATIC GAIN CONTROL (A.G.C.). E.P.Dement'ev.
Radiotekhnika, Vol.14, No.11, 58-66 (Nov., 1959). In Russian.
Discussed the causes of non-linear distortion arising in transistor amplifiers, whose gain is controlled either by emitter-current or collector-voltage change. Both resistive and resonant load conditions are considered and the appropriate quantitive relationships are derived. V.V.Zakharov

621.375.4

1605 A PRACTICAL APPROACH TO TRANSISTOR CIRCUIT DESIGN. J.D.Long.
Semiconductor Prod., Vol. 2, No. 11, 19-23 (Nov., 1959).
Approximate design equations are developed from the basic equivalent circuit of the transistor. It is indicated that junction transistor parameters vary with variations in emitter current and temperature. The variations which are important to a circuit designer are examined. In particular, the stability of the operating point in a Class A amplifier is discussed. An amplifier which is not stabilized for variations in temperature is compared to one that is stabilized. The input and output impedances, voltage gain, and operating point stability are calculated for the stabilized amplifier and compared to experimental results.

621.375.4 : 621.395.44

USE OF TRANSISTORIZED REPEATERS IN MULTICHANNEL TELEPHONE LINE SYSTEMS. See Abstr. 936

621.375.42

1606 MATCHING PROBLEMS IN TRANSISTOR TUNED AMPLIFIERS. V.V.Lebedev.
Radiotekhnika, Vol. 14, No. 9, 40-4 (Sept., 1959). In Russian.
An analysis of matching problems in tuned amplifiers is presented. Formulae for optimal power gain for given bandwidth in terms of transistor input and output resistances, chosen load and unloaded and loaded circuit magnification factors Q are derived and discussed, based on a simple equivalent circuit of a transistor, consisting of resistances only, all capacitances being neglected. Problems of unilateralization and stability are not considered. A.Landman

621.375.42

1607 FREQUENCY RESPONSE ANALYSIS OF A TRANSISTOR AMPLIFIER. N.I.Smirnov.
Radiotekhnika, Vol.14, No.9, 70-4 (Sept., 1959). In Russian.
The analysis is based on the Y-parameter representation of a transistor with respect to the diffusion process. Formulae for Y_{11}, Y_{21} and Y_{22} contain expressions for carrier life-time and cut-off frequency. A physical interpretation of Y-parameters follows, then a complete amplifier is considered by extending the equivalent circuit and adding further Y-elements for the external load, in particular for the case of an RC coupled amplifier. The performance of such a stage using a PIE transistor is then calculated, and its gain–frequency characteristic is shown to agree very closely with measurement. A.Landman

621.375.43

1608 FLOW GRAPH ANALYSIS OF TRANSISTOR FEEDBACK NETWORKS. P.Kaufmann and J.J.Klein.
Semiconductor Prod., Vol. 2, No. 10, 37-41 (Oct., 1959).
The input and output resistances, and voltage and current gains are calculated for the common-emitter and the common-base configurations. The common-collector configuration is approximated with a series voltage feedback. Equivalent circuit examples are given for all four basic circuits and their properties are discussed. The final section demonstrates the analysis of an example of multi-stage feedback for a series voltage configuration.

621.375.432

1609 TRANSISTOR STAGES FOR WIDE-BAND AMPLIFIERS. G.B.B.Chaplin, C.J.N. Candy and A.J.Cole.
Proc. Instn Elect. Engrs, Paper 2892 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 762-72, 789-92).
Republication, with discussion, of the paper abstracted in Abstr. 3657 (1959).

621.375.9 : 539.2 : 538.2 : 538.56

1610 MICROWAVE AND LOW-FREQUENCY OSCILLATIONS DUE TO RESONANCE INSTABILITIES IN FERRITES. M.T.Weiss.
J. appl. Phys., Supplement to: Vol. 30, No. 4, 146S-147S (April, 1959).
Microwave and low frequency oscillations have been observed in single crystal yttrium iron garnet disks placed in a microwave cavity with an applied d.c. field normal to the disk. These oscillations occur when the microwave power incident on the cavity exceeds a certain critical value in the milliwatt range. The oscillations occur as sidebands above and below the incident frequency and can also be observed as a modulation of the microwave output of the cavity. The above phenomenon is associated with the ferromagnetic resonance instability due to the fact that the resonant frequency of a disk depends on M_z and thus on the r.f. magnetic field used to drive it. The combination of the disk and the resonant cavity with high power, provides the conditions necessary for relaxation oscillations to be set up.

621.375.9 : 538.56

1611 EXPERIMENTAL STUDY OF THE MODIFIED SEMISTATIC FERRITE AMPLIFIER. W.L.Whirry and F.B.Wang.
J. appl. Phys., Supplement to: Vol. 30, No. 4, 150S-151S (April, 1959).
A ferromagnetic parametric amplifier operating at 5930 Mc/s is described. The imaginary component of the r.f. susceptibility at the signal frequency is shown to reach a negative maximum for

h_{dc} set at ferromagnetic resonance for the difference between pump and signal frequencies. The amplifier is operated both as a regenerative and super-regenerative amplifier using pulsed pump power. As a regenerative amplifier, steady state gains of 20 dB with a band width of 0.5 Mc/s are obtained. As a super-regenerative amplifier, gains of 130 dB with a band width greater than 1.5 Mc/s are obtained. Oscillations reach their limiting value at signal outputs of 150 to 350 W, depending upon ferrite temperature, and exhibit an initial spike. As a high gain super-regenerative amplifier, the input c.w. signal which doubles output average noise power is found to lie between −98 and −103 dBm.

621.375.9 : 538.56

1612 OPERATION OF A ZERO FIELD X-BAND MASER. J.E.King and R.W.Terhune.

J. appl. Phys., Vol. 30, No. 11, 1844-5 (Nov., 1959).

A maser using 0.1% nominal iron doped Al_2O_3 was successfully operated as an amplifier at 12.3 kMc/s, using only a very small magnetic field (120 Oe) for tuning. The pump frequency was 31.8 kMc/s, and the temperature of operation 4.2° K. S.A.Ahern

621.375.9 : 621.396.62 : 539.2 : 538.27 : 538.56

1613 ULTRA-LOW-NOISE MEASUREMENTS USING A HORN REFLECTOR ANTENNA AND A TRAVELING WAVE MASER. R.W.De Grasse, D.C.Hogg, E.A.Ohm and H.E.D.Scovil.

J. appl. Phys., Vol. 30, No. 12, 2013 (Dec., 1959).

A low-noise travelling-wave maser (Abstr. 4205 of 1959) and a low-noise horn reflector aerial have been combined to form an ultra low noise receiving system. Measurements made from Crawford Hill, near Holmdel, New Jersey, U.S.A., on cool clear winter nights at a frequency of 5.65 kMc/s and using a 20 Mc/s bandwidth, gave the following data: T(aerial, waveguide and maser) = 16.0 ± 0.8° K, T(sky zenith) = 2.5 ± 0.75° K. The temperature contribution from waveguide circuit and aerial copper loss is calculated to be 3.5 ± 0.2° K; leaving a value of 12.5 ± 1° K for the aerial and maser contributions. Further calculations give a value for the maser noise temperature of 10.5 ± 2° K. S.A.Ahern

621.375.9 : 538.56

1614 MASER BEHAVIOR: TEMPERATURE AND CONCENTRATION EFFECTS. T.H.Maiman.

J. appl. Phys., Vol. 31, No. 1, 222-3 (Jan., 1960).

A solid-state maser using Al_2O_3 : 0.2% Cr_2O_3 as the active material has been operated at 77.4° K, with a signal frequency of 9.14 kMc/s and using push-pull pumping at 23.1 kMc/s. Preliminary measurements give a gain–bandwidth product of about 14 Mc/s, and an effective noise temperature of 100° K excluding input losses. The construction of the maser is described. In addition, maser action has been observed at temperatures up to 195° K, using dry ice as the coolant. Preliminary studies to determine the effect of paramagnetic-ion density on maser performance are also reported. S.A.Ahern

621.375.9 : 538.56

1615 CAVITY MASER EXPERIMENTS USING RUBY AT S-BAND. W.S.C.Chang, J.Cromack and A.E.Siegman.

J. Electronics and Control, Vol.6, No.6, 508-26 (June, 1959).

A three-level solid-state maser using ruby has been operated at frequencies near 3 kMc/s, using a high-efficiency cavity having T.E.M. modes in a rectangular geometry. Two different operating points in the $\phi = 10°$ to $\theta = 30°$ region of the ruby spectrum gave maser operation with a pump frequency near 10.5 kMc/s, although the inversion obtained was a sensitive function of the exact operating point. An operating point at $\phi = 90°$, requiring pumping at 13.5 kMc/s, gave a gain–bandwidth product of better than 50 Mc/s. It was also found possible to pump the 1–4 or $\Delta M = 3$ transition at this same operating point, obtaining 3 kMc/s amplification with a 23.7 kMc/s pump frequency. Although this mode of operation was not fully explored, it is potentially capable of increasing the gain–bandwidth by a substantial amount.

621.375.9

1616 AN ANALYSIS OF PARAMETRIC AMPLIFICATION IN PERIODICALLY LOADED TRANSMISSION LINES. G.H.Heilmeier.

R.C.A. Rev., Vol. 20, No. 3, 442-54 (Sept., 1959).

A realistic approach to the theory of travelling-wave parametric amplifiers is presented. The propagating structure is considered as a lossless transmission line periodically loaded with nonlinear capacitance in the form of back-biased semiconductor diodes. Analysis of the loaded transmission line indicates the presences of stop and pass-bands instead of the all-pass property of the unloaded line. "Growing" waves at the signal and idle frequencies are produced if the phase and group velocities of the signal, idle, and pump waves are in the same direction. The gain of such a structure is a function of the nonlinearity of the capacitance of the loading diodes, the spacing of the diodes, the characteristic impedance of the unloaded line, the static capacitance of the diode, and the frequencies of operation.

621.375.9 : 621.382.23

1617 SELF-QUENCHING IN SUPER-REGENERATIVE PARAMETRIC AMPLIFIERS. I.Hefni.

Electronic Engng, Vol.31, 559 (Sept., 1959).

Briefly presents and discusses some observations of the dependence of quench frequency on self-bias resistance and of quench envelope waveform on pump power, for amplifiers using gold-bonded germanium diodes. F.F.Roberts

MODULATION . DEMODULATION

621.376.2

1618 TRANSIENT CROSS MODULATION IN THE DETECTION OF ASYMMETRIC SIDEBAND SIGNALS. T.Murakami and R.W.Sonnenfeldt.

R.C.A. Rev., Vol. 20, No. 3, 455-72 (Sept., 1959).

A detailed analytical study of transient cross-modulation in the detection of multiple-signal asymmetric-sideband systems is presented. Various signal conditions and detection methods are considered. The transient cross-talk in both an idealized system a and in a practical system is determined. Calculations show that the peak amplitude of the transient cross-modulation can be many times as large as the steady-state cross modulation. It is shown that product or synchronous detectors can eliminate the effects of cross-modulation.

621.376.22

1619 SYNCHRONOUS COMMUNICATION. H.Ekre.

Elektrotek. T., Vol. 72, No. 31, 447-53 (Nov. 5, 1959). In Norwegian.

Costas' method (Abstr. 2355 of 1957) for synchronous demodulation of double-sideband a.m. signals with suppressed carrier is described. The characteristic parameters of the synchronizing system and properties of the modulation system are discussed. Under normal conditions, the system gives the same s./n. ratio as a single-sideband system with the same average transmission power, and with selective fading, the double-sideband system has advantages. An experimental demodulator is described and a circuit diagram shown. It is well suited for data transmission on account of its ideal frequency control and its accurate reproduction of signal shape. Its use for phase-shift telegraphy is discussed and it is shown how the use of two sidebands permits interference filtering. G.N.J.Beck

621.376.223 : 621.382

1620 A DIODE MODULATOR FOR MILLIMETRE WAVES. K.J.S.Cave, W.Neu and A.C.Sim.

Proc. Instn Elect. Engrs, Paper 2907 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 759-61, 789-92).

Republication, with discussion, of the paper abstracted in Abstr. 2994 (1959).

621.376.232 : 621.385.623.5

1621 DETECTOR USES REFLEX KLYSTRON. K.Ishii.

Electronic Industr., Vol. 18, No. 11, 77-9 (Nov., 1959).

Description is given of a circuit employing a conventional klystron (X-band) for regenerative operation. The r.f. signal is injected into the resonator and the amplified video output appears in the repeller circuit. A small signal gain of 10-30 dB and a 3 dB bandwidth of more than 50 Mc/s is claimed. A.E.Karbowiak

621.376.3

1622 F.M. INTERFERENCE AND NOISE-SUPPRESSION PROPERTIES OF THE OSCILLATING LIMITER. E.J.Baghdady.

I.R.E. Trans Vehicular Commun., No. PGVC-13, 37-63 (Sept., 1959).

It is shown that an amplitude limiter with regenerative feedback can, under certain conditions, become an efficient interference suppressor, i.e. reject unwanted signals and interchannel noise. To achieve a worth-while improvement in capture performance, a critical amount of narrow-band positive feedback is applied, which causes the limiter to oscillate in the absence of an input at desired frequency. Fundamental differences between such an oscillatory limiter and a locked oscillator are pointed out, and a detailed analytical and vectorial treatment of the limiter design is presented, followed by a description of experimental work. Although the oscillatory action produces automatic noise squelch (from 20 to 30 dB) it also imposes limitations on the frequencies and minimum amplitudes of receivable signals in the form of a pull-in frequency range and a locking threshold. A thorough discussion of the methods of minimizing the above limitations, particularly the effect of the phase response of the feedback path, is then given. It is possible to operate two oscillating limiters in cascade. Four different experimental receivers and their performance are then described; numerous waveform oscillograms and other diagrams are given.

A.Landman

621.376.332

1623 ON THE THEORY OF FREQUENCY-DETECTORS. V.M.Sidorov.

Radiotekhnika, Vol. 14, No. 9, 29-39 (Sept., 1959). In Russian.

A general formula for the output voltage of a frequency-detector with non-ideal or no limiting is derived. Formulae for the strict determination of the complex amplitudes entering into the general formula are given, and also an approximate method of solution. The results are applied to parallel- and series-circuit types.

P.Collins

621.376.5 : 621.382

1624 THE APPLICATION OF TRANSISTORS TO DIGITAL SPEECH COMMUNICATION SYSTEMS. P.L.W.Gibbons.

Proc. Instn Elect. Engrs, Paper 2983 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 607-12, 633-6).

Republication, with discussion, of the paper abstracted in Abstr. 3670 (1959).

621.376.5 : 621.396.96

1625 THE PASSAGE OF A PULSE SIGNAL AND FLUCTUATION NOISE THROUGH A LIMITER AND INTEGRATOR. B.N.Mityashev.

Radiotekhnika, Vol. 14, No. 10, 49-56 (Oct., 1959). In Russian.

The output of a simple envelope detector is fed through an amplitude limiter, time-gate of definite width and an integrator to provide an output whose s./n. ratio is the subject of the analysis. A table is given of the optimum limiting level for several values of input s./n. ratio and gate width. Another table shows the improvement provided with the optimum parameters. As an approximate working rule it is suggested that the limit level should be twice the r.m.s. noise level. Photographs are given of experimental work carried out at 465 kc/s.

S.C.Dunn

621.376.53 : 621.382

1626 THE USE OF SEMICONDUCTOR DEVICES IN P.A.M. SYSTEM DEMODULATION. J.N.Barry and F.J.Nixon.

Proc. Instn Elect. Engrs, Paper 2961 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 577-86, 633-6).

Republication, with discussion, of the paper abstracted in Abstr. 3672 (1959).

621.376.9

1627 THE THEORY OF THE MAGNETIC RING MODULATOR. R.Elsner.

Arch. elekt. Übertragung, Vol. 13, No. 11, 486-94 (Nov., 1959). In German.

An equivalent circuit is derived for idealized B/H characteristics. The measurements reveal that the iron cores available at present are only approximations to the ideal requirements, the theory cannot therefore be directly verified. The equivalent circuit is, nevertheless, useful for designing the main features of the ring modulator. The particular advantage of this form of modulator over diode networks is the gain possible between the signal input and sideband output. It is also shown that the resistive impedance corresponding to tuning the output circuit to the lower sideband takes negative values in the signal circuit so that the arrangement acts as a parametric amplifier. An example is given of a practical circuit together with experimental results at a few kc/s.

S.C.Dunn

ELECTRONICS

SEMICONDUCTOR MATERIALS AND DEVICES

TRANSISTORS

621.382

1628 DIFFUSION OF ALUMINIUM TO THE SURFACE AND TO DISLOCATIONS IN SILICON. R.Bullough, R.C.Newman and J.Wakefield.

Proc. Instn Elect.Engrs, Paper 2873 E[International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959. (Part B Suppl. No. 15, 277-81, 329-30).

Republication, with discussion, of the paper abstracted in Abstr.2342 (1959).

621.382 : 621.317.3 : 537.311 : 539.2

1629 MEASUREMENT OF LIFETIMES IN SILICON. V.Husa and J.Kříž.

Slaboproudy Obzor, Vol. 20, No. 10, 615-17 (1959). In Czech.

The method is based on the principle of photocurrent modulation. The sample is illuminated transversely by means of short pulses (100μs) of infrared radiation. The change in current flowing through the sample (when illuminated by the pulse) is used to determine lifetime. The pulses are produced by a small rotating mirror which interrupts a focused beam derived from a Silit rod heated by a current of 16A. The method was compared with the cavity-resonator method and its accuracy was found to be satisfactory. The main advantages of the method are its simplicity and comparatively high sensitivity.

R.S.Sidorowicz

621.382.232

1630 THE DIFFUSION OF IMPURITIES INTO EVAPORATING SILICON. R.L.Batdorf and F.M.Smits.

Bell. Lab. Record, Vol. 37, No. 9, 330-3 (Sept., 1959).

Gives an illustrated description of the technique for the diffusion of donor and/or acceptor impurities into Si in a continuously evacuated quartz tube with temperature and geometry chosen so that the rate of evaporation of Si is such that p–n junctions are produced, in the steady state, at desired distances below the free surface of the Si.

F.F.Roberts

621.382.23

1631 OPERATIONAL AND STORAGE LIFE OF SILICON RECTIFIERS. C.L.Hanks.

Electronics, Vol.32, No.42, 82-4 (Oct. 16, 1959).

Describes a research programme to establish life-test procedures and a military specification for silicon rectifiers used in electronic equipment. The units tested were single-junction, lead-mounted, with outputs between 0.25 A 200 p.i. volts and 0.2 A 800 p.i. volts. 400 units were subjected to rated load, and 100 (rated at 800 p.i. volts) to severe overload in an ambient of 150°C; 500 were stored in an ambient of 25°C, and 500 at 150°C; the d.c. characteristics were measured periodically during the 2000 hour test. The 200 and 400 p.i. volt units showed no catastrophic failures; a few exceeded the specified forward and reverse limits, but operated satisfactorily, giving a failure rate below 0.5% per 1000 hrs. The 600 and 800 p.i. volt rectifiers had failure rates respectively 9 and 40 times greater than this. The cause was a contaminant which vaporized at 150°C and deposited itself near the junction on cooling. Tabulated results are given.

E.F.Hansford

621.382

1632 THERMAL-RESISTANCE CONSIDERATIONS IN THE DESIGN OF SEMICONDUCTOR DEVICES. C.A.Hogarth, A.Langridge and J.M.Ziman.

Proc. Instn Elect. Engrs, Paper 2968 E [International Convention on

Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 402-8, 434-6).

Republication, with discussion, of the paper abstracted in Abstr. 3676 (1959).

621.382

1633 RADIO NOISE IN SEMICONDUCTOR DEVICES. R.L.Strom.

Semiconductor Prod., Vol. 2, No. 10, 41-4 (Oct., 1959).

When used to rectify a.c. circuits, semiconductor devices generate radio noise in excess of airborne electronic specification limitations. The same characteristic noise has been found in germanium, selenium, and silicon and in various brands and types of semiconductor devices. It does not result from defects or from exceeding performance capabilities of the devices. Silicon devices exhibit higher noise levels. Radio interference suppression by restriction of operational rating does not appear to be a promising technique but conventional filter techniques are adequately effective.

621.382 : 620.18

1634 THE METALLOGRAPHIC EXAMINATION OF SEMICONDUCTOR DEVICES. G.Ashton and S.Marshall.

Proc. Instn Elect. Engrs, Paper 2875E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 437-41, 470-1).

Republication, with discussion, of the paper abstracted in Abstr. 2999 (1959).

621.382 : 621.317.61

THE DARK-SPOT METHOD FOR MEASURING THE DIFFUSION CONSTANT AND LENGTH OF EXCESS CHARGE CARRIERS IN SEMICONDUCTORS. See Abstr. 1391

621.382.032.27 : 621.357.7

ELECTROPLATING METAL CONTACTS ON GERMANIUM AND SILICON. See Abstr. 1473

621.382 : 655.225

1635 RECENT ADVANCES IN THE APPLICATION OF PHOTOLITHOGRAPHIC TECHNIQUES TO SEMICONDUCTOR DEVICES AND MICROMINIATURIZATION. T.M.Liimatainen.

Proc. Instn Elect. Engrs, Paper 2950 E [International Convention on Transistors and Associated Semiconductor Devices] publ. May, 1959 (Part B Suppl. No. 15, 385-90, 434-6).

Republication, with discussion, of the paper abstracted in Abstr. 3677 (1959).

621.382 : 621.315.59

1636 THE FREQUENCY BEHAVIOUR OF HALL GENERATORS. F.Kuhrt, H.J.Lippmann and K.Wiehl.

Arch. elekt. Übertragung, Vol. 13, No. 8, 341-7 (Aug., 1959). In German.

The behaviour of Hall generators in an r.f. magnetic alternating field is subjected to analytical and experimental investigation. Eddy currents induced by the alternating field in the semiconductor plate cause an increase in the Hall voltage with increasing frequency. A phase lead of Hall voltage with respect to the applied field also takes place. Amplitude increase and phase lead occur only if the semiconductor layer of the Hall generator is embedded into ferrite at either side, i.e. the air-gap height δ equals the thickness d of the semiconductor layer. The power dissipated by the eddy currents in the semiconductor layer is calculated; its influence on the maximum permissible control power is discussed.

621.382

1637 EMITTER EFFICIENCY AND INJECTION LEVEL IN DIFFUSED STRUCTURES. A.K.Jonscher.

Proc. Instn Elect. Engrs, Paper 2894 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 335-41, 368-9).

Republication, with discussion, of the paper abstracted in Abstr. 3026 (1959).

621.382

1638 ELECTRICAL BREAKDOWN IN GERMANIUM P–N JUNCTION. J.Yamaguchi and Y.Hamakawa.

Proc. Instn Elect. Engrs, Paper 2916E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 353-6, 368-9).

Republication, with discussion, of the paper abstracted in Abstr. 3013 (1959).

621.382

1639 THE FORWARD CHARACTERISTICS OF p^+–n–n^+ DIODES IN THEORY AND EXPERIMENT. J.Shields.

Proc. Instn Elect. Engrs, Paper 2938E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 342-52, 368-9).

Republication, with discussion, of the paper abstracted in Abstr. 3003 (1959).

621.382 : 539.2 : 537.311

1640 A CdS ANALOG DIODE AND TRIODE. W.Ruppel and R.W.Smith.

R.C.A.Rev., Vol. 20, No. 4, 702-14 (Dec., 1959).

An ideal insulator represents the "electrical analogue" of a vacuum since it is devoid of free charge carriers. Space-charge limited excess carriers can be drawn through an insulator across an ohmic contact which provides the reservoir of excess carriers. Diode and triode operation that is precisely analogous to the corresponding vacuum devices is obtained by applying ohmic and blocking contacts to the insulator. Analogue diode and triode operation is demonstrated using an insulating CdS single crystal.

621.382.2

1641 THE TUNNEL DIODE — CIRCUITS AND APPLICATIONS. I.A.Lesk, N.Holonyak,Jr and U.S.Davidsohn.

Electronics, Vol. 32, No. 48, 60-4 (Nov. 27, 1959).

An elementary outline of the basic properties and of the ways in which they may be modified by the addition of external components to produce a variety of useful circuit characteristics.

F.F.Roberts

621.382.2

1642 TAKING ADVANTAGE OF THE VOLTAGE SENSITIVITY OF THE SILICON CAPACITOR. J.G.Hammerslag.

Elect. Manufng, Vol. 64, No. 3, 172-7 (Sept., 1959).

The silicon junction diode exhibits a capacitance effect which can be varied by changing the d.c. bias (back) voltage on the device. Circuit uses include remote control of radio receiver, signal-seeking circuits covering a wide band, as well as automatic gain control and automatic frequency control. Factors affecting Q of the device are discussed; property curves are included.

621.382.2

1643 POWER DISSIPATION IN DIODE CLIPPERS. W.B.Mitchell.

Semiconductor Prod., Vol. 2, No. 10, 45-7 (Oct., 1959).

Equations are derived for the power dissipated for two cases: a very small duty cycle, and also a half sine wave. Nomographs are given to facilitate solution of these problems. These nomographs may also be used in calculating the power dissipated in rectifiers during forward conduction as well as in regulator or Zener diodes.

621.382.2

1644 VARIABLE CAPACITANCE DIFFUSED JUNCTION DIODES. W.MacDonald, D.Schultz and J.R.Madigan.

Semiconductor Prod., Vol. 2, No. 11, 29-34 (Nov., 1959).

The space charge layer capacitance has been calculated for some impurity distributions which are characteristic of diffused junction devices. For an exponentially graded junction the capacitance–bias voltage relation varies continuously from the characteristic of a linearly graded to that of an abrupt junction as the ratio of the width of the barrier layer to the diffusion length is varied. The results indicate that the high capacitance to bias voltage change of an alloy diode can be achieved by a suitable diffusion programme without sacrificing the other advantages of a diffused junction device.

621.383.2 : 621.318.57 : 621.374.32

HIGH-SPEED LIGHT OUTPUT SIGNALS FROM ELECTROLUMINESCENT STORAGE SYSTEMS. See Abstr. 1571

621.382.2 : 621.317.61

MEASUREMENT OF SEMICONDUCTOR DIODE SWITCHING CHARACTERISTICS. See Abstr. 1389

621.382.2/.3

1645 THE USE OF ORGANO-SUBSTITUTED HYDROLYZABLE SILANES ON SILICON DEVICES. B.Schwartz.

J. Electrochem. Soc., Vol. 106, No. 10, 871-3 (Oct., 1959).

The formation of silicone polymers directly from the monomers,

on the surface of silicon diodes, has resulted in devices with low reverse currents. Transistors treated in this way react in different ways due to the conditions imposed by the specific surface potentials involved.

621.382.23

1646 ZENER DIODE CHARACTERISTICS. M.R.Nicholls.
Electronic Engng, Vol.31, 559 (Sept. 1959).

Many diodes with nominal voltages between 4.7 and 9.1 V have been found to have three similar regions in their reverse current–voltage characteristics: (1) an initial region over which the current varies exponentially with the voltage; (2) an intermediate "Zener" region over which the voltage is nearly constant; and (3) an upper region in which the voltage rises again with current due to heating effects in the device. In region (1) the current increases 10 times per 0.75-1 V increase of voltage, this rate being independent of temperature for at least some of the diodes. F.F.Roberts

621.382.23 : 539.2 : 537.311

1647 GALLIUM-ARSENIDE DIFFUSED DIODES. J.Lowen and R.H.Rediker.
J. Electrochem. Soc., Vol. 107, No. 1, 26-9 (Jan., 1960).

GaAs has been used to fabricate variable reactance and computer diodes which compare favourably with the best commercially available of germanium and silicon. The diodes have been fabricated by zinc diffusion into n-type GaAs. Ohmic contact to the n-type material has been made with an Sb–Au alloy and to the p-type side with indium. Etching is used to remove the p-type diffused skin from everywhere but under the indium contact, thereby forming the mesa and defining the p–n junction area. Rectification ratios (at 2 V) as high as 10^{10} have been achieved. The diodes have been operated successfully in a variable reactance amplifier at S-band (2800 Mc/s) and in millimicrosecond-switching computer circuits.

621.382.23

1648 ELECTRICAL CHARACTERISTICS OF THIN-BASE SEMICONDUCTOR DIODES. B.O'Connor.
Proc. Instn Elect. Engrs, Paper 2920E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 555-61, 567).

Republication, with discussion, of the paper abstracted in Abstr. 3004 (1959).

621.382.23 : 621.375.9

SELF-QUENCHING IN SUPER-REGENERATIVE PARAMETRIC AMPLIFIERS. See Abstr. 1617

621.382.232 : 537.311 : 539.2

1649 GaAs TUNNEL DIODES. R.Gremmelmaier and H.J.Henkel.
Z. Naturforsch., Vol. 14a, No. 12, 1072-3 (Dec., 1959). In German.

The higher energy gap and low effective mass mean that tunnel diodes can probably be made with improved properties when GaAs is used in preference to other semiconductors. The characteristics of three such diodes made by alloying tin onto p-type GaAs are given at room temperature and at 450 and 100°K. The useful characteristic is improved by cooling. C.A.Hogarth

621.382.233

1650 A METHOD OF PREPARING SEMICONDUCTOR P-N-P-N SWITCHING DEVICES. R.Freestone.
Proc. Instn Elect. Engrs, Paper 2886E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B, Suppl. No. 15, 459-62, 470-1).

Republication, with discussion, of the paper abstracted in Abstr. 3011 (1959).

621.382.3

1651 AN ELECTRIC ANALOG OF HEAT FLOW IN POWER TRANSISTORS.
J.Reese, W.W.Grannemann and J.R.Durant.
Trans Amer. Inst. Elect. Engrs I, Vol. 78, 640-3 (1959) = Commun. and Electronics, No. 45 (Nov., 1959).

An electric analogue of heat flow in alloyed-junction power transistors was constructed to facilitate a study of instantaneous crystal temperatures under various pulsed conditions. An equivalent T-section transmission line using lumped constants was chosen. The derivation of the transmission-line analogues given, along with construction and operating procedures. A short comparison of analogue and experimental data is included.

621.382.3 : 621.317.61

MEASUREMENT OF EQUIVALENT CIRCUIT PARAMETERS OF TRANSISTORS AT V.H.F. See Abstr. 1393

621.382.3 : 621.374.32

COMPUTING TRANSISTOR SWITCHING DISSIPATION. See Abstr. 1559

621.382.333

1652 VOLTAGE BREAKDOWN IN JUNCTION TRANSISTORS UNDER GENERAL CIRCUIT CONDITIONS. W.Guggenbühl.
Arch. elekt. Übertragung, Vol. 13, No. 11, 451-61 (Nov., 1959). In German.

Mainly a useful detailed analysis of avalanche-breakdown effect on the output-circuit characteristics for a general form of d.c. bias circuit. Some transient effect in reactive circuits are included, though only qualitatively. F.F.Roberts

621.382.333

1653 TRANSIENT JUNCTION TEMPERATURES IN POWER TRANSISTORS. W.W.Grannemann and J.D.Reese.
Elect. Engng, Vol. 79, No. 1, 53-7 (Jan., 1960).

This study covers pulsed input wave forms. A simple thermal model of a power transistor is assumed and a heat-flow analysis of the model, using Laplace transforms, is made.

621.382.333

1654 CALCULATION OF A COMPOUND TRANSISTOR EQUIVALENT CIRCUIT. Yu.L.Kurkin and A.A.Sokolov.
Elektrichestvo, 1959, No. 8, 62-4 (Aug.). In Russian.

The compound transistor is a series-fed arrangement of two transistors with a common collector load. The common-base compound circuit operates with the input signal connected to the emitter of the second unit, of which the base is directly strapped to the emitter of the first, grounded base, unit. The common-emitter configuration operates with the base input to the second transistor, the emitter of the first unit being grounded. Hybrid (h) parameters for both circuits are derived in terms of h parameters of each constituent transistor. The calculation of the temperature stabilization of the second configuration is of particular interest. The common-base compound circuit is very suitable for stable d.c. amplifiers of low impedance input. Generally speaking, the compound α is very high (approx. 0.999), and a stability 10-25 times higher than that of single transistors is obtainable. A.Landman

621.382.333

1655 CONTROLLED SEMICONDUCTOR RECTIFIER. E.Ya.Pumper.
Elektrichestvo, 1959, No. 8, 65-8 (Aug.). In Russian.

Presents a configuration in which a transistor in common-emitter switching mode controls the current of a diode in the collector circuit. Efficiency, load and dissipation power are discussed in detail. P.Szekely

621.382.333

1656 ON THE FREQUENCY RESPONSE OF CERTAIN EQUIVALENT CIRCUITS OF JUNCTION TRANSISTORS. G/Zoldan.
Elettrotecnica, Vol. 46, No. 12, 853-7 (Dec. 10, 1959). In Italian.

Obtains the common-emitter h-parameters for the hybrid-π and general T equivalent circuits and shows that the corresponding parameters cannot be made identical at all frequencies unless either an admittance g_s is added in the T circuit between the emitter and collector terminals or an impedance (in general frequency-dependent) is added in series with the conventional base resistance in the T circuit. A particular T-circuit is proposed. F.F.Roberts

621.382.333

1657 A SINGLE EQUIVALENT CIRCUIT OF A JUNCTION TRANSISTOR UNDER CONSIDERATION OF TEMPERATURE DEPENDENCE. J.Winter.
Frequenz, Vol. 13, No. 11, 351-9 (Nov., 1959). In German.

The analysis presented is based on well-known papers by Shockley, Krömer, Pritchard and Giacoletto and follows very closely the recent investigation by Moorgat–Pick (See Abstr. 3681 and 4801 of 1959). Of particular interest are: approach to transistor active network as a pentode analogue; detailed discussion of temperature-dependent transistor parameters; mathematical analysis of the one-dimensional model of the inner drift transistor in the common base configuration, as proposed by Krömer. An extensive bibliography is appended. A.Landman

621.382.333

1658 A DOUBLE DIFFUSED SILICON HIGH-FREQUENCY SWITCHING TRANSISTOR PRODUCED BY OXIDE MASKING TECHNIQUES.

J.F.Aschner, C.A.Bittmann, W.F.J.Hare and J.J.Kleimack.

J. Electrochem. Soc., Vol. 106, No. 5, 415-17 (May, 1959).

The relative merits of two double-diffused transistor structures are discussed, one of which employs a localized emitter. A process for producing the localized emitter structure is described employing the masking property of SiO_2 against the subsequent phosphorous diffusion. The dimensions of each emitter are controlled closely by etching away this oxide mask from only those regions not protected by a specially prepared photo resist coating. Transistors have been produced which switch 30 mA with a gain of 12, in times in which the sum of the turn-on, storage, and turn-off time is less than 0.1 μsec. Small signal alphas of 0.97, and alpha cut-off frequencies in the common base connection in excess of 300 Mc/s have been achieved.

621.382.333

1659 ALPHA CUT-OFF FREQUENCY OF TRANSISTORS WITH CURVED JUNCTIONS. T.Sugano.

J. Inst. Elect. Commun. Engrs Japan, Vol. 42, No. 9, 838-43 (Sept., 1959). In Japanese.

Alloy junction transistors often have curved emitter and collector junction surfaces. For such a transistor, formulae are derived for the alpha cut-off frequency in terms of the dimensions of the junctions and the diffusion constant of the minority carriers, the transistor having a low injection level and the junction surfaces being co-ordinate surfaces of a prolate spheroidal coordinate system. Experimental results confirm the theory. The alpha cut-off frequency of transistors with curved junctions is much lower than that of similar transistors with planar junctions. A.Wilkinson

621.382.333

1660 DESIGN CONSIDERATIONS OF A GRADED-BASE TRANSISTOR WITH IMPROVED EMITTER-BASE BREAKDOWN VOLTAGE. W.Fulop.

Proc. Instn Elect. Engrs, Paper 2918E [International Convention on on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 375-84, 434-6).

Republication, with discussion, of the paper abstracted in Abstr. 3018 (1959).

621.382.333

1661 BIDIRECTIONAL TRANSISTORS AND THEIR USES IN SWITCHING CIRCUITS.

J.Evans, D.S.Ridler and R.W.A.Scarr.

Proc. Instn Elect. Engrs, Paper 2972 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 391-7, 434-6).

Republication, with discussion, of the paper abstracted in Abstr. 3687 (1959).

621.382.333 : 620.18

1662 METHODS OF SECTIONING AND ETCHING TRANSISTORS FOR MICROSCOPIC EXAMINATION.

D.Baker.

Proc. Instn Elect. Engrs, Paper 2936E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 442-4, 470-1).

Republication, with discussion, of the paper abstracted in Abstr. 3020 (1959).

621.382.333 : 620.18

1663 RAPID SECTIONING OF TRANSISTORS.

J.E.Hughes and S.Ratcliffe.

Proc. Instn Elect. Engrs, Paper 2864E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 15, 451-3, 470-1).

Republication, with discussion, of the paper abstracted in Abstr. 2348 (1959).

621.382.333

1664 THE R.F. TRANSISTOR AS A CIRCUIT ELEMENT. L.Garlatti.

Rev. Electrotec., Vol. 65, No. 7, 245-50 (July); No. 8, 291-8 (Aug., 1959). In Spanish.

Reviews equivalent circuits, admittance matrix representations and manipulations, maximum available power gain and its frequency dependence, and unilateralization circuits, and considers in more detail the conditions determining the regions of stability of the latter circuits. F.F.Roberts

621.382.333

1665 EQUIVALENT Y-PARAMETERS OF A TRANSISTOR WITH RESISTIVE EMITTER LOAD. E.N.Garmash.

Radiotekhnika, Vol. 14, No. 11, 67-72 (Nov., 1959). In Russian.

Formulae for Y_{11}', Y_{12}', Y_{21}' and Y_{22}' are derived in terms of common-base configuration Y-parameters and the emitter load impedance Z. Typical values of the four parameters are plotted v. ohmic emitter load (0 to 1000 Ω). Two practical examples are considered; calculation of gain and input conductance of an amplifier with emitter and collector resistive loads, and calculation of required emitter load for a given input conductance. A brief analysis of the effect of emitter load on the h.f. performance of the transistor is included. A.Landman

621.382.333

1666 LARGE SIGNAL CHARACTERISTICS OF THE SILICON UNIJUNCTION TRANSISTOR. T.P.Sylvan.

Semiconductor Prod., Vol. 2, No. 10, 29-35 (Oct., 1959).

The silicon unijunction transistor is a unique device which features a stable negative resistance characteristic, a stable firing voltage and a very low firing current. A simple equivalent circuit is derived from the construction of the device and its theory of operation. This equivalent circuit is then used to describe the important electrical characteristics and to predict their variation with bias point and temperature.

621.382.333

1667 A MODIFICATION OF THE THEORY OF THE VARIATION OF JUNCTION TRANSISTOR CURRENT GAIN WITH OPERATING POINT AND FREQUENCY. A.W.Matz.

J. Electronics and Control, Vol. 7, No. 2, 133-52 (Aug., 1959).

A modified solution is discussed of the continuity equation for minority carrier flow in junction transistors, obtained by adhering strictly to the space-charge neutrality approximation and applying alternative boundary conditions which differ from those usually taken principally in that a finite minority carrier density is permitted at the collector. An extension of the modified analysis to a.c. conditions is given, and a comparatively simple working formula for the intrinsic short-circuit a.c. gain is determined as a function of operating point and frequency. The common-base cut-off frequency f_α is evaluated, and the maximum in the variation of the f_α with emitter current, which has been observed experimentally, is associated with reduced d.c. emitter efficiency at high levels and is related to the corresponding fall-off in d.c. alpha. Experimental results are presented to show that, for a transistor with given cut-off frequency, both the electrical and metallurgical base widths are smaller than is normally supposed, and yet $\partial W/\partial V_C$ is larger than normally supposed as evidenced by measurements of punch-through voltage V_p. A theoretical explanation of both effects is offered.

621.382.333.3

1668 ALLOYING WITH CONTROLLED SPREADING IN SILICON TRANSISTORS. II.

J.Roschen, T.J.Miles and C.G.Thornton.

Semiconductor Prod., Vol. 2, No. 9, 35-7 (Sept., 1959).

For Pt I see Abstr. 7417 (1959). The dissolution of silicon is accomplished by an unsaturated solution at the final alloying temperature and spreading is essentially eliminated. Rapid heating, coupled with silicon having a low density of edge dislocations and close control of pre-alloying base-width, evaporated aluminium film thickness, final alloying temperature, and cooling cycle results in junctions that are planar—parallel with a significant improvement in the distribution of electrical characteristics.

621.382.333.3

1669 EFFECTS OF OPERATION OF GERMANIUM ALLOY JUNCTION TRANSISTORS ABOVE RATED CONDITIONS. B.C.Spradlin.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 346-52 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

Presents data obtained from 1000 hr accelerated life tests on two types of p-n-p high-frequency switching transistors. Ambient temperatures were in the range 80-120°C and dissipations were from 100 to 200 mW, with 20 transistors per combination of ageing conditions. F.F.Roberts

621.382.333.33

1670 THE CHARACTERISTIC FREQUENCIES OF A DRIFT TRANSISTOR. J.M.Rollett.

J. Electronics and Control, Vol. 7, No. 3, 193-213 (Sept.,1959).

Certain conventionally defined characteristic frequencies of a drift transistor are related to each other, to the basic transistor parameters, and to minority carrier time constants, using the theory of the simple one-dimensional model. The frequencies are the common emitter and common base cut-off frequencies, and the frequency at which the magnitude of the common emitter short circuit current gain is unity; the minority carrier time constants are the effective lifetime, the average transit time, and the average time of stay in the base. Several approximations for the frequency variation of the current gains are given, and used to find how junction capacitances and base resistance affect the measurement of the characteristic frequencies. Finally the maximum frequency of oscillation is discussed, and the high-frequency figure of merit redefined in a way compatible with the conventional definition.

PHOTOELECTRIC DEVICES

621.383 : 665

1671 PHOTO-ELECTRIC COINCIDENCE METHODS FOR THE REGULATION OF REGISTER IN INTAGLIO PRINTING-PRESSES. H.Schwartz.

Bull. Assoc. Suisse Elect., Vol. 50, No. 24, 1171-6 (Nov. 21, 1959). In German.

In multi-colour printing, in which the various colours are superposed, it is necessary that the registering of the colours should be within less than 0.1 mm. An electronic method using photo-cells is described in detail with many diagrams. R.G.Jakeman

621.383

1672 THE OPTIMUM STATE FOR USING PHOTODIODES IN RECORDING SMALL SIGNALS.

N.A.Vitovskii, P.I.Maleev and S.M.Ryvkin.

Radiotekhnika i Elektronika, Vol.4, No.8, 1387-92 (Aug., 1959). In Russian.

Considers the relative advantages of the photodiode and valve states for signal conversion and shows that the low-temperature valve-state is best. This state, apart from being as good as the photodiode state as regards size of output signal and inertia, has an extremely low noise level, leading to a large increase in the photodiode threshold sensitivity. Experimental curves relate to the temperature range +20 to −100°C. D.E.Brown

621.383.2 : 539.2 : 535

1673 SOLID-STATE OPTOELECTRONICS. E.E.Loebner.

R.C.A. Rev., Vol. 20, No. 4, 715-43 (Dec., 1959).

Discusses the uses of photoelectric and luminescent phenomena. A description is given of optico-electronic modulators and amplifiers, i.e. devices which have mixed optical and electrical signal and power access. The technology of assembling image-transmitting, image-storing, and picture reproducing panels from optico-electronic elements is reviewed. The functioning of various optico-electronic logic nets and computer components is treated in detail. A synthesis of panel technology and logic circuitry into novel picture-processing panels and computer systems is proposed. The similarity between the organizational structure of such parallel processing systems and that of the neuron network of vertebrate retinas is pointed out.

621.383.2.032.35 : 539.2 : 535.37

1674 MICROSCOPIC OBSERVATIONS ON ELECTRO-LUMINESCENT PHOSPHORS. A.Kremheller.

J. Electrochem. Soc., Vol. 107, No. 1, 8-12 (Jan., 1960).

The electroluminescent brightness of single phosphor particles is studied microscopically in liquid dielectric cells. A simple visual technique in conjunction with a microscope permits one to analyse the brightness distribution within and among electroluminescent particles. Some experimental results are presented on the nonuniformity of the emission, the influence of ball milling and acid etching on the brightness, the improvement of brightness by particle separation, the analysis of the integrated light output as a function of the processing temperature, and the brightness changes due to particle orientation, contact, and irradiation.

621.383.2.032.35 : 539.2 : 535.37

1675 VOLTAGE DEPENDENCE AND PARTICLE SIZE DISTRIBUTION OF ELECTROLUMINESCENT PHOSPHORS. W.Lehmann.

J. Electrochem. Soc., Vol. 107, No. 1, 20-6 (Jan., 1960).

The particle sizes of electroluminescent ZnS phosphors prepared by common firing techniques usually range over broad distributions which always have the same shape. Every phosphor of this "normal" particle size distribution shows a voltage (V) dependence of electroluminescent brightness (L) which, over many decades of L, can closely be described by

$$L = L_0 \exp\left[-(V_0/V)^{0.5}\right].$$

Every deviation of the particle size distribution from the "normal" form also causes a deviation of the measurable L(V) dependence from this expression. Measurements on phosphor particles and on uniform phosphor films indicate that the basic excitation mechanism of electroluminescence follows the voltage dependence

$$L = L_0 \exp\left[-(V_0/V)\right]$$

and that the square root in the exponent of the usual equation is due mainly to the broad particle size distribution of regular phosphors. This view is supported also by a mathematical analysis.

621.383.2.032.35 : 539.2 : 535.37

1676 ELECTROLUMINESCENCE OF POLYCRYSTALLITES. S.Larach and R.E.Shrader.

R.C.A. Rev., Vol.20, No.4, 532-63 (Dec., 1959).

The important aspects of luminescence and of electroluminescence are discussed, including incandescance, differences between electroluminescence and other types of luminescence, designing electroluminescent materials to emit in any desired (visible) spectral range, nature of the energy-absorbing layer, and various electrical and optical aspects of the electroluminescence from polycrystallites.

621.383.2.032.35 : 537.533

1677 THE ROLE OF SPACE-CHARGE CURRENTS IN LIGHT AMPLIFIERS. A.Rose and R.H.Bube.

R.C.A. Rev., Vol.20, No.4, 648-57 (Dec., 1959).

The light-gain, the operating input light level and the exposure for single pictures are derived for light amplifiers of the sandwich type using adjacent layers of photoconductor and electroluminescent material. A key parameter in these relations is the voltage V_∞ at which space-charge current flow is initiated in the photoconductor. Also involved is a factor M which measures the ratio of recombination centres to traps, both evaluated near the Fermi level. Present photoconductors should permit : (a) light-gains of over 100-fold to be achieved at television frame rates; (b) operation at television frame rates with input light intensities as low as 10^{-3} lm/ft^2; and (c) exposures for single pictures approaching photographic speeds. Improved performance depends strongly on attaining higher values of M in photoconductors.

621.383.2.032.35 : 539.2 : 535.37

1678 PROPERTIES OF A SINGLE-ELEMENT LIGHT AMPLIFIER USING SINTERED CADMIUM SELENIDE PHOTOCONDUCTIVE MATERIAL. F.H.Nicoll.

R.C.A. Rev., Vol.20, No.4, 658-69 (Dec., 1959).

The use of photoconductive sintered cadmium selenide as the control element in a light amplifier offers the possibility of improved gain and speed of response. Such a single-element light amplifier has been made and tested. The results show that moderate gains with high output luminance are possible with speeds in a range suitable for moving pictures. Very high gains are possible if slow response can be tolerated. Measurements were made over a range of operating frequencies and for various input levels. Data on rise time, decay time and gain for tungsten-light input are given in curve form. From these curves the operating range and input-output light level for useful picture reproduction can be determined.

621.383.2.032.35.535-8

1679 SOLID-STATE IMAGE INTENSIFIER UNDER DYNAMIC OPERATION. C.P.Hadley and R.W.Christensen.

R.C.A. Rev., Vol.20, No.4, 670-81 (Dec., 1959).

Describes the performance of photoconductor/electroluminescent-phosphor image intensifiers under dynamic conditions of operation. Both experimental data and theory are presented. The theory is based on some simplifying assumptions which allow easy analysis and permit an insight into the importance of the various parameters.

the experimental data, however, confirm the applicability of the analysis. Some suggestions concerning the possible improvement of intensifier performance are made.

621.383.2.032.35 : 539.2 : 535.37

1680 OPTICAL FEEDBACK TYPE STORAGE LIGHT INTENSIFIERS. H.O.Hook.

R.C.A. Rev., Vol. 20, No. 4, 744-52 (Dec., 1959).

Three designs of storage light intensifiers were evaluated by building samples. One design uses a Fotoform glass structure to support the photoconductor and electroluminor and to provide optical isolation of cells. Another uses a transparent (glass or plastic) multiple pedestal structure to provide light paths through the photoconductor and support the active materials. The photoconductor itself provides the optical isolation. The third design uses a flat glass plate as a support, the active materials and optical isolation being built up in layer fashion. Devices of the last type worked best. Typical operation provided optical trigger of 0.1 lm/ft^2 sec, half-hour storage and 0.1 sec erasure in a 12 in.^{2} panel with 250 000 storage cells. With suitable operating conditions, half-tone pictures could be displayed for 1 min. or longer.

621.383.2.032.35

1681 APPLICATIONS OF ELECTROLUMINESCENT CELLS AS ELECTRICAL CIRCUIT ELEMENTS.

R.B.Lochinger and M.J.O.Strutt.

Scientia Electrica, Vol. 5, No. 3, 77-92 (Sept., 1959). In German.

Analysis is made of a circuit comprising an electroluminescent cell, a photoresistor in series with it, and an ohmic resistor in parallel with the photoresistor. Light from the cell falls on the photoresistor. The voltage–current characteristic shows an inflection where its first differential becomes negative over a small range, and a small change in the ohmic resistor will produce a large change in current. Replacement of the ohmic resistor by a capacitor gives a similar characteristic. It is also shown that the same elements can be combined to isolate and amplify low-frequency signals from a carrier of a few kc/s frequency. S.T.Henderson

621.383.27 : 539.1.07

1682 LUMINESCENT EFFECTS IN PHOTOMULTIPLIER TUBE FACES AND PLEXIGLAS CERENKOV DETECTORS. K.A.Anderson.

Rev. sci. Instrum., Vol.30, No.10, 869-73 (Oct., 1959).

By means of 20 and 35 MeV proton beams obtained from the University of Minnesota Linac, luminescent effects in Plexiglas Cherenkov detectors have been investigated. It was found that 1% of the protons entering the detector produced light pulses which overlapped the μ-meson Cherenkov light distribution. These light pulses correspond to losses in a sodium iodide crystal of mainly less than 20 keV. Luminescent effects in the glass face of the particular photomultiplier employed were also studied and found to be quite large.

621.383.4 : 539.2 : 537.312

1683 CADMIUM SULFIDE PHOTOCONDUCTIVE SINTERED LAYERS. M.J.B.Thomas and E.J.Zdanuk.

J. Electrochem. Soc., Vol. 106, No. 11, 964-71 (Nov., 1959).

The preparation and performance of sintered photoconductive CdS layers are described. Although the photoconductive characteristics are directly dependent on composition, layer preparative techniques, and geometry of the unit, these parameters may be predicted and controlled to give a resultant reproducible layer of desired electrical and optical characteristics.

621.383.4 : 539.2 : 537.312

1684 INFRARED PHOTOCONDUCTIVE DETECTORS USING IMPURITY-ACTIVATED GERMANIUM–SILICON ALLOYS. G.A.Morton, M.L.Schultz and W.E.Harty.

R.C.A. Rev., Vol.20, No.4, 599-634 (Dec., 1959).

A new class of sensitive infrared photoconductors is described wherein the long-wavelength limit can be adjusted to meet the requirements of their application in detectors. This makes it possible to minimize the cooling needed to obtain a given detectivity and to reduce background radiation noise. The general theory of impurity-activated photoconductors and the noise which determines their sensitivity in a detector are discussed. The class of extrinsic photoconductors consisting of Ge–Si alloys is studied. The long-wavelength limit is determined by the activator impurity, the alloy composition, and the activator compensation. The performance of gold- and zinc-activated alloys is described in detail. The peak detectivity, D_m^*, of the two materials for a given long-wavelength limit and temperature is approximately the same, but the shapes of their spectral response curves are very different. A zinc-activated alloy with a 14-m long-wavelength limit will have a detectivity of the order of $D_m^* = 2 \times 10$ cm/W when cooled to temperatures attainable with a liquid oxygen–nitrogen mixture at reduced pressure. Such a photoconductor is well suited for application in the long-wavelength atmospheric window. Optical and electronic problems of adapting these photoconductors to detector cells for this and other applications are considered.

621.383.4 : 539.2 : 537.312

1685 SINTERED CADMIUM SULFIDE PHOTOCONDUCTIVE CELLS. C.P.Hadley and E.Fischer.

R.C.A. Rev., Vol.20, No.4, 635-47 (Dec., 1959).

Fabrication techniques are discussed, together with the properties of the host materials, activation impurities, electrodes, and packaging. A theory is presented regarding energy-level structure, sensitivity, time effects, geometry, ohmic contacts, and gamma. The characteristics are discussed with respect to practical applications.

621.383.8 : 621.311.61

1686 SOLAR BATTERIES FOR USE AS THE POWER SOURCE OF UNATTENDED V.H.F. REPEATERS.

M.Kobayashi, Y.Ishikawa and K.Hayashi.

Proc. Instn Elect. Engrs, Paper 2960 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 726-30, 746-7).

Republication, with discussion, of the paper abstracted in Abstr. 3702 (1959).

621.383.8 : 537.312

1687 THE PHOTOVOLTAIC EFFECT AND ITS UTILIZATION. P.Rappaport.

R.C.A.Rev., Vol. 20, No. 3, 373-97 (Sept., 1959).

Use of the photovoltaic effect for converting solar energy directly into electrical energy is described. Attention is given to considerations of the optimum semiconductor material and of how it changes with operating temperature. Experimental results are presented which show operating characteristics and conversion efficiencies of a number of materials including silicon, gallium arsenide, indium phosphide and cadmium sulphide. The high-voltage (~100V) photovoltaic effect obtained with evaporated CdTe films is described. A discussion of the major problems still to be solved is included.

PARTICLE ACCELERATORS

621.384.62 : 537.54

1688 NEW ELECTROSTATIC ACCELERATOR. I.Michael, E.D.Berners, F.J.Eppling, D.J.Knecht, L.C.Northcliffe, and R.G.Herb.

Rev. sci. Instrum., Vol. 30, No. 10, 855-63 (Oct., 1959).

A new electrostatic accelerator has been constructed and tested. The entire vacuum system including the accelerating tube and ion source is of bakable construction. The accelerating tube, corona tube, and support column are constructed of thin metal disks hard-soldered to alimina ceramic rings and the insulation length of each is 5 ft. Without the accelerating tube the generator has been operated at potentials in excess of 7 MV corresponding to gradients of over 1400 kV/ft. With flat disk molybdenum electrodes usable voltage was limited to 2.1 MV. When these electrodes were replaced by a flat disk steel electrodes having smaller beam apertures and provided with side pumpout holes, the accelerator was operated for short times at potentials in excess of 4 MV corresponding to a tube gradient of over 800 kV/ft. There was no evidence of small discharges or electron loading in the tube. During the course of these tests three tube ceramics were cracked—probably by sparking—and it is now difficult to operate the machine at potentials much above 3.5 MV. Voltage division is accomplished by a series of negative point-to-plane corona gaps which are enclosed in a tube. The charging belt is equipped with paper staples which are charged by induction. Accelerator voltage is very stable.

ELECTRON TUBES

621.385.032.213.13 : 539.2 : 537.2 : 537.533

1689 NON-STATIONARY PROCESSES IN THE ALUNDUM [FUSED ALUMINA] COATING OF RADIO-VALVE HEATERS AND THEIR ORIGIN. Yu.K.Shalabutov.
Fiz. tverdogo Tela, Vol. 1, No. 2, 296-306 (Feb., 1959). In Russian.

The dynamic V–I characteristics of leakage currents between cathodes and Alundum-coated heaters in radio valves were found to be different from the static characteristics : the dynamic currents were higher and hysteretic loops were observed in the dynamic characteristics. These effects are shown to be due to the formation of space charge by positive ions (high-voltage polarization) in the Alundum coating. These ions are due to defects and impurities in Alundum; the latter may be introduced in the manufacture or in the operation, of the valves. A.Tybulewicz

621.385.1

1690 THE ELECTROKINETIC POWER THEOREM. H.W.König.
Arch. elekt. Übertragung, Vol. 13, No. 11, 475-6 (Nov., 1959). In German.

It is shown that, by using suitable definitions for the kinetic energy density and the kinetic power density, the theorem can be made to hold for arbitrary electron velocities (i.e. for relativistic conditions). V.G.Welsby

621.385.1

1691 THE BEHAVIOR OF RHENIUM IN ELECTRON TUBE ENVIRONMENTS.
G.B.Gaines, C.T.Sims and R.I.Jaffee.
J. Electrochem. Soc., Vol. 106, No. 10, 881-5 (Oct., 1959).

Rhenium, tungsten, and rhenium-coated tungsten have been exposed to carburizing atmospheres and to water-cycle attack, rhenium and tungsten to aluminium oxide at 1750°C for 7000 hr, and rhenium to boron-containing atmospheres. It was confirmed that rhenium, unlike most other refractory metals, does not form a carbide. Rhenium forms a boride, which forms a eutetic with another boride or with rhenium, and melts under 2250°C. Thoriated rhenium maintains microstructural and mechanical integrity after long exposure in vacuum at 1750°C in contact with alumina. Rhenium and rhenium-coated tungsten are highly resistant to water-cycle effects.

621.385.1

1692 DETERMINATION OF LEAD-WIRE INDUCTANCES IN MINIATURE TUBES. W.A.Harris and R.N.Peterson.
R.C.A. Rev., Vol. 20, No. 3, 485-98 (Sept., 1959).

Describes measurements of internal inductances and resonant frequencies in miniature tubes operating in the u.h.f. television band. Measurement techniques are described, and the equivalent circuits of several miniature tubes are presented. The significance of the measurements with respect to tube and circuit design is discussed. The feedback elements, or elements common to input and output circuits, are found to be of particular importance.

621.385.1

1693 THE USE OF SILICA SEALS IN THE PRODUCTION OF SPECIAL VALVES WITH NUMEROUS LEAD-IN WIRES. M.Pequignot and M.Verna.
Vide, Vol. 14, 290-4 (Sept.-Oct., 1959). In French.

Where silica is necessary as part of a valve envelope it has been usual to seal the lead-in wires by one of three methods: (a) a graded glass and silica seal between tungsten or molybdenum wires and the valve envelope; (b) a seal between the silica and lead-coated molybdenum wires; and (c) an oxide-free seal to tungsten wires with special silica. A process is described for sealing molybdenum wires direct to silica using the principles of glass–copper sealing. The molybdenum, in the form of thin strips, is sealed between two concentric silica cylinders which are forced together at the sealing temperature by atmospheric pressure. A thorough degassing schedule is essential and the seal must be made slowly to allow the molybdenum strips to deform gradually to the required shape. Seals of this type can be baked to a temperature of 900-1000°C without risk of vacuum leakage. B.Dunford

621.385.4

1694 NEW GRID-CONTROLLED VALVES FOR U.H.F. TELEVISION TRANSMITTERS. W.Kleen.
Arch. elekt. Übertragung, Vol. 13, No. 11, 467-74 (Nov., 1959). In German.

Describes two air-cooled tetrodes for the 460-790 Mc/s range. Peak synch. signal powers are 2.2 and 10 kW respectively. Anode potentials are low, 3.3 and 5.0 kV, and efficiencies high (45 and 54%). However, the gain is much less than that of a klystron and the mean overall efficiency of a transmitter would probably be about 30%. A.H.W.Beck

621.385.6

1695 DESIGN, THEORY, AND CHARACTERISTICS OF THE HELITRON—A NEW TYPE OF MICROWAVE OSCILLATOR. G.Wada and R.Pantell.
I.R.E. WESCON Convention Record, Vol. 3, Pt 3, 92-102 (1959).

For background see Abstr. 422 (1959). The theory originally given was incorrect and a new theory in which the tube is considered as an "O" type device with bunching in the θ direction is established. A developmental tube tuning from 480-1020 Mc/s with voltage range 770-1830 V and 2-5 mW output is described. The advantage of the tube is that no focusing magnet is required. A.H.W.Beck

621.385.6

1696 NOISE IN ELECTRON BEAMS AND IN FOUR-TERMINAL NETWORKS. M.T.Vlaardingerbroek.
Philips Res. Rep., Vol. 14, No. 4, 327-36 (Oct., 1959).

It is shown that calculation of the minimum noise figure of electron-beam amplifiers, obtainable by varying the physical properties of the lossless beam transducer between the electron gun and the interaction region, can be performed in a manner similar to calculation of the minimum noise figure of network fourpoles obtainable by varying the signal-source impedance. The similarity between the propagation of noise fluctuations along electron beams and the transformation of noise sources across passive fourpoles is emphasized.

621.385.624

1697 SOME EXPERIMENTS ON BROAD-BAND C.W. POWER KLYSTRONS AT X-BAND.
M.O.Bryant and C.P.Lea-Wilson.
J. Electronics and Control, Vol. 6, No. 6, 481-98 (June, 1959).

Describes some experiments to assess the bandwidth capability of a stagger-tuned multicavity klystron for a c.w. power output of several hundred watts. Design philosophy is discussed and it is pointed out that the available bandwidth is ultimately limited by the maximum electron current density which can be used. This in turn depends on the maximum magnetic focusing field available. The experiments show that with a magnetic field of 2500 G the bandwidth of a 4-cavity klystron operating between 200 and 400 W with a power gain of 25 dB and a maximum efficiency of 12% is limited to 1%. This performance compares favourably with that of a travelling-wave tube, designed to fit the same magnet, in respect of gain–bandwidth product but unfavourably in respect of efficiency–bandwidth product.

621.385.632.1

1698 TRAVELLING-WAVE TUBE ANALOGUE. G.D.Sims and I.M.Stephenson.
Electronic Technol., Vol. 37, No. 1, 20-4 (Jan., 1960).

Deals with some of the problems involved in the design and construction of a travelling-wave tube analogue. It shows that by using the lumped-circuit principle and designing the inductance drift-tube structure to provide a given impedance and phase shift, the properties of any travelling-wave tube whose structure possesses equivalent parameters can be simulated, regardless of its actual physical form.

621.385.632.1

1699 ON THE MINIMUM NOISE FIGURE OF TRAVELLING-WAVE TUBES — A THEORY CONSIDERING THE NOISE REDUCTION OF THE POTENTIAL-MINIMUM PLANE. T.Ohkoshi.
J. Inst. Elect. Commun. Engrs Japan, Vol. 42, No. 9, 833-8 (Sept., 1959). In Japanese.

The Haus–Robinson formula for the minimum noise figure (see Abstr. 350 of 1956) and Watkins' earlier theory on the noise reduction at the potential-minimum plane (see Abstr. 3387 of 1955) are utilized in computations of the minimum noise figure of travelling-wave tubes, the generalized diode potential profile given by Langmuir and typical emission characteristics of the oxide-coated cathode being used throughout the calculations. One result of the calculations is to show that a higher current density at the potential-minimum plane is desirable, if all sources of noise except Rack's velocity fluctuation and the reduced shot-noise current are neglected.

Under such assumptions, the theoretical minimum noise figure could be reduced to about 2.2 dB for a frequency of 1000 Mc/s and to about 4.2 dB for 3160 Mc/s if a beam–current density as high as 300 mA/cm^2 could be realized at the potential-minimum plane. Since the calculations depend on the assumptions used in Watkins' theory, they should be regarded rather as suggestions for development than for design purposes, as practical considerations appear to indicate that high beam–current densities are undesirable for low-noise travelling-wave tubes. A.Wilkinson

621.385.632.1

1700 MEDIUM-POWER L- AND S-BAND ELECTROSTATICALLY FOCUSED TRAVELING-WAVE TUBES. D.J.Blattner, F.E.Vaccaro, C.L.Cuccia and W.C.Johnson. R.C.A. Rev., Vol. 20, No. 3, 426-41 (Sept., 1959).

A developmental electrostatically focused travelling-wave tube is first described. The tube employs a bifilar helix as both r.f. circuit and electrostatic focusing structure, and can use either a parallel- or convergent-flow electron gun of conventional design. Outstanding advantages of this device are light weight, independence of environment, and freedom from ion oscillation. A product-development tube suitable for operation in both L- and S-bands at the five-watt level is then described. The objectives for this tube included stable and long-life operation, rugged packaging with air-cooling of the collector, operability over a wide range of frequencies with a fixed set of helix voltages, and characteristics which were substantially reproducible from tube to tube. This tube is longer than the advanced-development tube described in part I, operates at a higher gain and lower power level, and has lower beam current. New techniques and components developed for this tube are described; these include the technique for bonding the glass to the bifilar helices, and the capsule, helical couplers, attenuator, and electron-gun supports. Part of the information in this paper was covered by Abstr. 1041 (1959).

621.385.632.2

1701 THE LIMITS OF GAIN OF TRAVELLING-WAVE TUBES FOR RADIO LINKS. W.Klein. Arch. elekt. Übertragung, Vol. 13, No. 7, 273-86 (July, 1959). In German.

After introductory remarks on the use of travelling-wave tubes in radio links, the most important parameters influencing the gain of travelling-wave tubes are discussed, including different methods of focusing the electron beam. Possible upper limits for gain are investigated, as far as noise and oscillation by internal reflections are concerned. Calculation of reflections of a non-uniform active helix line with a localized attenuation shows the influence of these reflections on gain, delay and impedance fluctuations. Characteristic measurements confirm the validity of the theoretical investigations described.

621.385.633

1702 ANALYSIS OF THE O-TYPE BACKWARD-WAVE OSCILLATOR FREQUENCY PUSHING. I.Sakuraba. J. Inst. Elect. Commun. Engrs Japan, Vol 42, No. 9, 810-15 (Sept., 1959). In Japanese.

The frequency pushing depending on space charge and on circuit loss is calculated under the assumptions that the phase-velocity conditions are satisfied, that the value of the interaction parameter is small, and that the tube acts as a linear device. The results obtained for the cases of small, medium, and large space-charge are summarized. Good experimental confirmation of the results was obtained with a helix type of backward-wave oscillator. A.Wilkinson

621.385.64

1703 SOME FEATURES OF A MAGNETRON WITH SECONDARY EMISSION CATHODE. L.A.Rivlin. Radiotekhnika i Elektronika, Vol. 4, No. 9, 1505-12 (Sept., 1959). In Russian.

Establishes from phenomenological considerations the differential equation for the anode current of this type of magnetron and analyses the stationary solutions. Graphs of the various functions are included. The establishment of the anode current on excitation of a pulse magnetron is discussed, using certain simplifying assumptions. The theoretical results obtained here are in qualitative agreement with the experimental data to be found in Gel'vich. D.E.Brown

621.385.64 : 621.372.852.22

A DE-COUPLER FOR AN H.F. TRANSMISSION LINE FOR A MICROTRON. See Abstr. 1513

621.385.833 : 537.533

1704 COMMENTS ON A PAPER BY D.H.TREVENA ENTITLED "ON SPACE CHARGE WAVES". R.H.C.Newton. J. Electronics and Control, Vol.6, No.4, 321-3 (April, 1959).

Considers disagreement between the authors' results (Abstr. 460 of 1959) on "magnetic" space charge wave anodes in a cylindrical electron stream from a magnetically shielded cathode, and those of Trevena (Abstr.1699 of 1959) and others. Attributes it to the latter's neglect of the perturbation of radial electric field off the steady-state trajectory. B.Meltzer

621.385.833 : 537.533

1705 THEORY OF THE FOCUSING OF SHEET BEAMS IN PERIODIC FIELDS. P.A.Sturrock. J. Electronics and Control, Vol. 7, No. 2, 153-61 (Aug., 1959).

Equations determining the paraxial behaviour of sheet beams in periodic focusing fields are established. Space-charge is taken into account, and its effect upon stability is investigated. It is proved that, if space-charge is neglected, any such focusing system is convergent. A procedure for determining optimum lamellar-flow configurations is set out, and approximate formulae for the perveance of such focusing systems are presented.

621.385.833 : 537.533

1706 MAGNETIC DEFLECTION FOCUSING. P.A.Sturrock. J. Electronics and Control, Vol. 7, No. 2, 162-8 (Aug., 1959).

A scheme for focusing sheet beams by means of a periodic configuration of magnetic fields directed transverse to the beam is presented. Discussion of a particular model gives information about stability limits and perveance. This scheme, which lends itself to the incorporation of intense magnetic fields, should be immune to the space-charge instabilities of beams focused in longitudinal magnetic fields. The focusing mechanism is such as to produce coupling between the beam and electromagnetic waves of phase velocity exceeding the velocity of light. Application to millimetre-wave tubes is anticipated.

621.386.8

1707 INVESTIGATION OF IONOGRAPHIC TECHNIQUES. R.A.Youshaw and J.A.Holloway. Nondestr. Test., Vol. 17, No. 5, 297-302 (Sept.-Oct., 1959).

The current status of Ionography, a process of X-ray imaging on inexpensive vinyl employing electrostatic principles, is reviewed to date. Experimental data are presented on the relation between the mesh to vinyl distance and the image quality and speed of exposure. The ionographic phenomenon of image enlargement is discussed. Newly discovered alternate methods for forming an ionographic image are described.

GAS DISCHARGES
GAS-DISCHARGE TUBES

621.387 : 537.52

1708 A STUDY OF ANODE OSCILLATIONS IN A LOW PRESSURE DISCHARGE. A.A.Zaitsev and K.I.Éfendiev. Izv. Akad. Nauk SSSR, Ser. fiz., Vol. 23, No. 8, 1012-16 (1959). In Russian.

This study has been carried out in connection with the development of noise sources for use in test equipment and also as a general means of furthering knowledge about discharge processes. Three types of anode have been used: a divided electrode consisting of three separate parts of similar size; a rod; and a half cylinder. The discharge current varied between the limits 0.1 to 7.0 A. The pressure of the mercury vapour was controlled by a water bath. It was found that when regular oscillations took place the anode voltage drop was always higher than the exciting potential of Hg atoms. Motion of the cathode spot, while it did not destroy the form and stability of the anode oscillations, gave rise to separate irregular oscillations superposed upon the anode oscillations. When the vapour pressure was reduced and the discharge current increased, the amplitude of the oscillations and the average value of the voltage drop

increased. The frequency of the oscillations lay between 10^4 and 10^5 c/s. Studies were also made in inert gases (He, Ne, Ar, Kr) on pressures below 10^{-3} and 1 mm Hg and at discharge currents up to 300 mA. When the anode dimensions were decreased the amplitude and frequency of the oscillations increased. At a fixed pressure, current and anode size, the relationship between atomic weight and frequency was regular and reciprocal. A simple explanation is given of the facts in terms of a second, moving plasma in a dynamic condition. S.C.Dunn

621.387 : 621.372.413 : 537.52

1709 THE EFFECT OF FIELD CONFIGURATION ON GAS DISCHARGE BREAKDOWN IN MICROWAVE CAVITIES AT LOW PRESSURE. S.A.Self and H.A.H.Boot.
J. Electronics and Control, Vol. 6, No. 6, 527-47 (June, 1959).

A new regime of high-frequency gas discharge breakdown in nonuniform fields at low pressures is predicted on theoretical grounds and experimentally confirmed. The controlling mechanism is the time-averaged Lorentz force on the electrons, proportional to the gradient of the square of the electric field amplitude ($\nabla|E|^2$). This steady force is derivable from a potential, and field configurations are realizable in microwave cavities corresponding to potential hills or wells, exemplified by E_{010} and E_{011} cylindrical cavities respectively. In the former case the steady force acts to disperse electrons towards the walls, increasing the loss of electrons and raising the breakdown field, whereas in the latter case the steady force acts to confine electrons, inhibiting electron loss and lowering the breakdown field. The effect becomes marked at levels of field intensity for which the height of the potential hill or well becomes comparable with the ionization energy. Breakdown fields have been measured for hydrogen in E_{010} and E_{011} X-band cavities in the pressure range 30 mm Hg to 7×10^{-3} mm Hg. The peak breakdown fields range from 400 to 30 000 V/cm. At the higher pressures and lower fields the results are in agreement with the diffusion theory. However, at the lower pressures and higher fields the behaviour of the two cavities is markedly different and qualitatively confirms the controlling effect of the time-averaged Lorentz force.

621.387 : 621.039

1710 A BRIEF REVIEW OF THE TOROIDAL STABILIZED PINCH. R.J.Bickerton.
Proc. Instn Elect. Engrs, Paper 2883 [Convention on Thermonuclear Processes] publ. April, 1959 (Vol. 106A, 148-51, 182-5).

Republication, with discussion, of the paper already abstracted in Abstr. 3086 (1959).

621.387 : 621.3.039 : 537.56 : 539.17

1711 RAPID HEATING FOR CONTROLLED FUSION RESEARCH. R.A.Fitch.
Proc. Instn Elect. Engrs, Paper 3107 [Convention on Thermonuclear Processes] Vol. 106A, Suppl. No. 2, 177-81, 182-6 (1959).

The reasons for seeking a means of rapidly heating a plasma to thermonuclear temperatures are discussed, and it is suggested that shock compression by a rapidly increased magnetic field is a possible method. The problems of producing and maintaining such fields are considered, and it is concluded that capacitor discharge banks with the minimum inductance are required for both phases. The design of low-inductance condenser banks is discussed and it is suggested that the maximum rate of current rise attainable with presently available materials is about 10^{14} A/sec.

621.387

1712 OPERATING CHARACTERISTICS OF STABILIZER TUBES. B.Pína.
Slaboproudy Obzor, Vol.20, No.11, 683-6 (1959). In Czech.

A large number of special tests and measurements was carried out on gas-discharge voltage stabilizer tubes, types Tesla 11TA31 and 14TA31. The following quantities were recorded: (1) spread of ignition voltage between individual tubes; (2) difference between ignition voltages during consecutive strikes; (3) temperature dependence of ignition voltage; (4) current–voltage characteristics and their temperature dependence; (5) stabilization time (the time necessary for the tube to reach its normal stabilizing voltage); and (6) impedance characteristics as a function of frequency and operating current. Results of the measurements are indicated in graphs and tables. R.S.Sidorowicz

621.387 : 621.316.5

1713 MOVEMENT OF LONG A.C. ARCS IN MODEL TESTS. W.Mosch.
Wiss. Z. Tech. Hochsch. Dresden, Vol. 8, No. 4, 859-68 (1958-59). In German.

The forces acting on an a.c. arc are investigated in detail, e.g. thermal uplift, air resistance, longitudinal tension and current forces. A series of model tests was performed after choosing a suitable scale for these tests. The tests referred to different arrangements of the electrodes, e.g. with opposing or parallel bars arranged horizontally or vertically. General laws were then found for the movement and speed of travel of the arcs. Minimum current values were established for the travel of arcs between parallel circular bars in which the speed of travel became independent of the arrangement of the bars and the arc began to travel against the thermal uplift. Finally the influence of a high permeability plate arranged parallel to the arc was investigated. R.Neumann

621.387.464 : 539.1.07 : 537.535

1714 RESOLVING POWER OF SCINTILLATION MULTIPLIERS AND ITS DEPENDENCE ON VARIOUS PARAMETERS (CORRECTION).
P.Görlich, A.Krohs, H.J.Pohl, R.Reichel and L.Schmidt.
Z. angew. Phys., Vol. 10, No. 12, 576 (Dec., 1958). In German.

Owing to the abscissa [Fig. 1 in the original paper (Abstr. 5971 of 1958)] having been shifted by 75 keV instead of a 5.7 keV shift of the ordinate, a considerable error was introduced. Nine γ lines used for calibration are listed. F.Lachman

ELECTRONIC EQUIPMENT

621.389

1715 WHAT DESIGNERS SHOULD KNOW ABOUT HUMIDITY. A.P.Harris and E.W.Parrott.
Electronics, Vol. 32, No. 44, 50-5 (Oct. 30, 1959).

Deals with the effect of humidity on certain electronic equipment. Topics discussed are: the water molecule, the frequencies at which vapour can absorb energy from an electromagnetic field, natural humidity conditions, effect of humidity on parts and materials, mechanisms of entry, humidity testing, designing against humidity. Some of the conclusions drawn are: (1) the physical and electrical properties of water are critically dependent on temperature; (2) water in two states is readily absorbed in most materials used in electronic assemblies and will permeate through leaks in imperfect seals in parts and assemblies, even though these leaks are microscopically small; (3) the electrical properties of water are such that even very small amounts will alter the electrical characteristics of parts beyond acceptable limits; (4) the penetration of water through imperfect seals is largely a function of the water vapour pressure present; (5) the mechanism of vapour entry depends on whether the environment is one of low vapour pressure or of high vapour pressure. Natural humid conditions, with vapour pressure as low as 4 mm Hg or as high as 28 mm Hg cause entry by low pressure mechanisms; (6) because of the severity of humidity tests, the wide tolerances permitted, the temperature dependence of the electrical characteristics of water, the formation of fugitive water films and possible variation in leak sizes, correlation by sample testing is difficult, sometimes impossible. H.A.Miller

621.389

1716 MINIATURIZATION AND MICRO-MINIATURIZATION. G.W.A.Dummer.
Wireless Wld, Vol. 65, No. 11, 545-9 (Dec., 1959).

Describes how extreme miniaturization of transistor circuits has been aided by new developments. Due to the low operating voltages and low power ratings it is possible to design transistor components using extremely thin films of resistive, magnetic, conductive or semiconducting materials. Assembly techniques discussed include the micromodule system, circuit assemblies, solid assemblies and sealed assemblies. A table gives a comparison of packing density and estimated reliability in connection with different forms of construction and diagrams illustrate stages in production of high-definition film-type resistors with terminals, and gold-electrode magnesium-fluoride-dielectric capacitors. H.A.Miller

621.389

1717 THREE APPROACHES TO MICROMINIATURIZATION. R.Langford.

Electronics, Vol. 32, No. 50, 49-52 (Dec. 11, 1959).

Construction methods for fabricating extremely small electronic circuits and components are outlined in detail and future applications are examined.

621.389

1718 THE USE OF ULTRASOUND TO CLEAN THE PORES OF WORK PIECES. P.Wenk.

Frequenz, Vol. 13, No. 8, 245-9 (Aug., 1959). In German.

Ultrasound cleans materials by a cavitation process, and the production of cavitation depends upon the characteristics of the liquid in which the ultrasound is produced. Good cleansing depends, therefore, on the liquid and on its temperature. Descriptions are given of typical industrial ultrasonic generators and of the arrangements for holding the liquid and controlling its temperature.

A.C.Whiffin

621.389

1719 FLUOROCHEMICAL-VAPOR COOLING TECHNIQUES IN ELECTRONIC EQUIPMENT.

L.F.Kilham, R.R.Ursch and J.F.Ahearn.

Elect. Manufng, Vol.64, No.2, 88-92 (Aug., 1959).

A study of fluorochemical vapours used as dielectric and heat-transfer materials. The properties of these materials are discussed, different types of cooling systems, and special design parameters are presented. Supporting data in the form of charts, tables and mathematical formulae are given.

621.389

1720 AIR FILTERS FOR ELECTRONIC EQUIPMENT. T.G.Nessler.

Elect. Manufng, Vol. 64, No. 2, 128-31 (Aug., 1959).

The selection and application of mechanical air filters for use in the cooling systems of electronic equipment, particularly as applied to military equipment. Various types (viscous impingement, electrostatic and dry) are described and their characteristics are enumerated.

621.389

1721 ENGINEERED COOLING CUTS EQUIPMENT BULK. A.D.Kraus.

Elect. Manufng, Vol. 64, No. 3, 94-102, 216 (Sept., 1959).

Basic methods of heat-exchanger design are presented, with examples.

621.389

1722 UNIFORM COOLING AIR FLOW DURING COMPUTER MAINTENANCE AND OPERATION. A.Perlmutter.

I.R.E. Trans Compon. Parts, Vol. CP-6, No. 3, 180-9 (Sept., 1959).

Enumerates the problems and design criteria of a cooling system for digital equipments, and describes a solution applicable to many systems. The packages containing the computer circuitry are plugged into a rack having hollow shelves from which air is blown over the components through orifices. The throttling effect of the orifices produces balance, enabling any number of packages to be removed without altering the cooling of the remainder. The orifices also create a high-velocity jet stream of air, which is deflected by the next shelf to give a uniform cooling, first to the heat-sensitive components like diodes, then to the hot components. A summary of the results of a temperature test is followed by six pages of illustrations. E.F.Hansford

621.389

1723 ELECTRONIC CIRCUIT TOLERANCES. K.S.Packard, M.Goldstein, N.Stone and J.Cavallari.

I.R.E. WESCON Convention Record, Vol. 3, Pt 6, 38-45 (1959).

A method of circuit tolerance testing that permits a numerical reliability statement was developed and an instrument for performing this test rapidly and automatically is described. The procedure is based on the variability of circuit parameters resulting from any or all influences and provides a means of simulated environmental testing. Assuming mutual independence of environmental effects, or if the correlation among the effects is known, combined environments may be simulated.

621.389

1724 CONTROLLING MAGNETIC FIELD INTERFERENCE IN WIRING. T.H.Herring.

Elect. Manufng, Vol. 64, No. 4, 127-9 (Oct., 1959).

A practical and efficient means of determining the proper spacing between circuits to avoid magnetic field interference in complicated wiring systems such as those found on large airplanes is presented. Various figures of merit are calculated for the sensitive and the source circuits and a nomograph provides the unknown spacing value.

621.389

1725 EXPERIENCE GAINED IN THE TROPICALIZATION OF ELECTRONIC EQUIPMENT. S.Kubík.

Slaboproudy Obzor, Vol. 20, No. 8, 496-8 (1959). In Czech.

The recent years have witnessed the export of special (type T) Czechoslovak electrical equipment to subtropical and tropical countries (Brazil, Egypt, India, China). The equipment was designed for indoor use and employed the modern standard components and materials. The experience has shown that the equipment proved successful in the subtropics. It could also be used in moderate tropical conditions, provided it was technologically faultless and adequately protected during its transport. The materials employed in the equipment comprised: (1) impregnated (quality S) paper; (2) noval-B pressed plastics; (3) polystyrene; (4) impregnating varnishes; (5) cadmium or chromium plated steel; (6) enamels (for the coating of steel components); (7) aluminium alloy castings; and (8) nickel-plated copper and brass. The screws, nuts and solder joints in the equipment were thoroughly cleaned and protected with a layer of suitable varnish. The problem of tropicalized electronic equipment has not been solved. It is first necessary to develop the whole range of suitable tropicalized components. R.S.Sidorowicz

621.389

1726 INFLUENCE OF THE CLIMATIC FACTORS ON ELECTRICAL EQUIPMENT IN THE TROPICS AND ELECTRICAL CLIMATOLOGY. M.Rychtera.

Slaboproudy Obzor, Vol. 20, No. 8, 499-505 (1959). In Czech.

For the purpose of the design of electrical equipment the climates are divided into three groups: (1) moderate or normal regions (N); (2) tropics (T); and (3) cold climates (F). The tropics comprise: (1) dry tropical climates (TA); (2) humid climates (TH); and (3) subtropical regions (TS). The following climatic factors influencing the characteristics and the performance of electrical equipment in various climates (tropics, in particular) are reviewed: (1) effect of the air temperatures (elevated, low and variable temperatures); (2) effect of humidity (low, high and variable humidity); (3) atmospheric pollution (brine, dust, sand, ashes and chemical impurities); (4) radiation effects (ultraviolet and infrared); (5) low pressures; (6) winds and storms. The main characteristics of the climates are indicated in a table. R.S.Sidorowicz

621.389.049.75

1727 PACKAGED ELECTRONIC CIRCUITS. A.S.Khouri.

Elect. Manufng, Vol. 64, No. 4, 164-6 (Oct., 1959).

Miniaturized printed-circuit assemblies which utilize printed capacitors and resistors on ceramic plates with supplementary capacitors where needed are described. Provision for circuit alignment with active components (tubes, transistors) is also possible.

621.389

1728 THE GIBBON-MAYO PUMP-OXYGENATOR. R.E.Jones.

I.R.E. Trans Med. Electronics, Vol. ME-6, No. 2, 92-9 (June, 1959).

Describes, with illustrations, a roller-type blood pump and variable-speed drive.

621.389

1729 DESIGN CONSIDERATIONS FOR AN AUTOMATIC REARVIEW MIRROR. G.Platzer and L.Gau.

I.R.E. Trans Industr. Electronics, No. PGIE-10, 43-7 (July, 1959).

Describes an electronically controlled prismatic rear-view motor car mirror. While driving at night the wedge-shaped mirror is automatically tilted when necessary, so that much of the glare from headlights of following cars is reflected away from the driver's eyes. Light falling on a photocell actuates a relay which energizes an electromagnet and causes it to attract a steel plate cemented to the back of the mirror glass. The mirror is pivoted and stopped in such a way as to tilt by an amount equal to the wedge angle. A switch is provided on the front of the mirror so that the driver can change the sensitivity for city or country driving (to cope with the difference in ambient light) or switch off. A printed circuit is used to mount and connect the components, all resistors being contained in a packaged circuit. The CdS photocell is mounted on the chassis and looks through a hole in the silvered surface of the mirror.

H.A.Miller

621.389 : 574

1730 PULSE-HEIGHT ANALYZER FOR NEURO-PHYSIOLOGICAL APPLICATIONS. R.M.Littauer and C.Walcott.
Rev. sci. Instrum., Vol. 30, No. 12, 1102-6 (Dec., 1959).

A five-channel differential pulse-height analyser is described, designed specifically for the observation of action potentials in nerve fibres. By measurement of the pulse amplitudes, it is possible to follow the activity of one or more single nerve fibres continuously.

621.389

1731 LOGIC NETWORKS AID PSYCHOLOGICAL TESTING. C.C.Foster.
Electronics, Vol. 32, No. 42, 70-1 (Oct. 16, 1959).

A transistorized problem-posing device has a panel on which are mounted in a circle six numbered and three lettered illuminated pushbuttons together with a tenth illuminated pushbutton in the centre. There is also a signal light which is illuminated and extinguished for successive periods of four seconds known as "day" and "night". An interchangeable plug-in connection unit corresponds to logical relations shown on an interchangeable disk fitting over the pushbuttons. The connections are shown on the disk, as lines connecting the various buttons, and the logical relations, which are not indicated, may be: "full cause", "and", "or", or "not". Each light is illuminated during any time period according to whether or not the appropriate lights connected to it were illuminated during the previous period. In learning about the device, the subject is allowed to use any of the pushbuttons so as to discover how to light the centre button by the use of the three lettered buttons only. By determining how the subject solves problems, the psychologists assess his intelligence. G.A.Montgomerie

TELECOMMUNICATION

621.39

1732 THE DEVELOPED SPECTRA OF PHONEMES OF THE FRENCH LANGUAGE. P.Chavasse and L.Pimonow.
Ann. Telecomm., Vol. 14, No. 11-12, 301-12 (Nov., 1959). In French.

A frequency analyser has been developed for the visual display of the spectra and amplitude of transient sounds. The frequency range covered is 50 - 16 000 c/s. Pictures are shown which display the characteristics of 52 basic sounds of the French language. The pictures portray (i) spectral amplitude v. frequency for each sound; and (ii) variation of spectral density over the frequency range with time in each case. G.D.Sims

621.39

1733 A METHOD OF COMPUTING AN ORIGINAL MESSAGE, TO ANY DESIRED DEGREE OF ACCURACY, FROM A FINITE NUMBER OF MEASUREMENTS AFTER AN IDEAL BAND-PASS FILTER. H.Wolter.
Arch. elekt. Übertragung, Vol. 13, No. 9, 393-404 (Sept., 1959). In German.

If a finite message is received with a device providing an extremely sharp cut-off at the edges of the frequency band there is a theorem showing that the accuracy of the received message, for a finite number of measurements, is limited but that the bandwidth and duration of the message do not impose an absolute limit to the information content. A proof of this is given and methods of computation discussed. V.G.Welsby

621.391

1734 CUMULATIVE DISTRIBUTION FUNCTIONS FOR A SINUSOID PLUS GAUSSIAN NOISE.
A.Levine and R.B.McGhee.
I.R.E. Trans Inform. Theory, Vol. IT-5, No. 2, 90-1 (June, 1959).

The probability that the amplitude of a variable, consisting of a sinusoidal signal corrupted by uncorrelated additive Gaussian noise, will lie within a given range depends on the cumulative probability distribution function. A table giving the values of this function for a wide range of values of s./n. ratio and of amplitude, is given. G.D.Sims

621.391

1735 ON THE CHARACTERISTICS OF ERROR-CORRECTING CODES. R.Chien.
I.R.E. Trans Inform. Theory, Vol. IT-5, No. 2, 91 (June, 1959).

It has been pointed out previously (Abstr. 3752 of 1959) that in order for a code to correct e-errors, no set of 2e or less characteristics should be linearly dependent (mod 2) and conversely. This point is illustrated with reference to basic group theory and mapping. It is shown, en passant, that the minimum distance of a group code is d only if every set of d-1 vectors of the characteristic matrix is independent. G.D.Sims

621.391

1736 THE PROBABILITY DENSITY OF THE OUTPUT OF A FILTER WHEN THE INPUT IS A RANDOM TELEGRAPHIC SIGNAL. J.A.McFadden.
I.R.E. Nat. Convention Record, Vol. 7, Pt 4, 164-9 (1959).

Considers the probability density of the output of a linear system when the input is a random square wave. Inputs considered are (a) the usual "random telegraphic signal", or random square wave of Poisson type; (b) the random square wave of alternate-Poisson type; and (c) the symmetric, periodic square wave with random phase. If the filter is an ideal integrator with finite memory, solutions are given for inputs (a), (b), and (c) and compared. For a simple RC low-pass filter, the solution for (c) is compared with the known solution for (a). For a general stationary, binary input, the solution for the simple RC high-pass filter is expressed in terms of the solution for the corresponding low-pass filter. Then solutions are derived for inputs (a) and (c). In all cases, limiting solutions for very long integration times are discussed. See also Abstr. 5478 of 1959.

621.391

1737 AN EXPERIMENTAL INVESTIGATION OF LAGUERRE FUNCTION SEPARATION METHODS. A.G.Leont'ev.
Radiotekhnika, Vol.14, No.8, 22-5 (Aug., 1959). In Russian.

The n-th order Laguerre function is obtained by passing approximately unit pulses from a blocking oscillator to n lattice-type passive linear-networks mutually isolated by cathode followers. Oscillograms are shown of the first five functions. The two fundamental methods of separating out functions of any orthogonal systems are described: (a) by direct use of the definition of orthogonality: (b) by using the Duhamel integral. An experimental link was built (for the possibility of using Laguerre functions as information carriers see Elektrosvyaz', No.10, 1958) so that both these methods could be tested, and the block diagram is illustrated. Sources of error are discussed. D.E.Brown

621.391

1738 BINARY STORAGE SYSTEMS WITH TWO-THRESHOLD ANALYZERS.
A.E.Basharinov, B.S.Fleishman and M.A.Samokhina.
Radiotekhnika i Elektronika, Vol. 4, No. 9, 1419-26 (Sept., 1959). In Russian.

Sequential-analysis binary-storage systems for the detection of signals in noise are discussed, and theoretical and experimental data quoted regarding the storage-length distribution functions. Relationships are obtained in the case of fluctuating signals of small intensity for the choice of optimum discretization threshold, and the "loss" of the binary system is evaluated as compared with the corresponding system of continuous optimum processing. D.E.Brown

TELEGRAPH AND TELEPHONE SYSTEMS

621.394 : 621.396.611.1

1739 STUDY OF THE INFLUENCE OF THE OSCILLATOR VALVE CHARACTERISTIC ON THE TELEGRAPH SIGNAL SPECTRUM. B.A.Kravchenko.
Radiotekhnika, Vol.14, No.7, 29-32 (July, 1959). In Russian.

The front edge of the controlling signal is assumed to follow the law of capacitor charging, and the back edge the law of capacitor discharging. Spectra at the beginning and at the end of the signal are assumed to be independent of each other. The oscillator-valve characteristic is approximated by a combination of exponential and

linear functions. Spectral functions for the impulses in the grid and in the anode are derived and compared. A practical example is calculated. Interference in the anode circuit can be reduced at the expense of increasing the negative bias voltage.

J.M.Silberstein

621.394 : 621.391.833.4

1740 TELEGRAPH DISTORTION ON PHYSICAL (D.C.) LINES AND TELEGRAPH MACHINES.

D.W.E.Wheele and E.G.Collier.

Post Off. elect. Engrs' J., Vol. 52, Pt 1, 61-8 (April, 1959).

The Telegraph Distortion Analyser has been used to make detailed investigations of the telegraph signal distortion introduced by physical (d.c.) lines, telegraph machines and v.f. telegraph channels. This article describes how the work on physical lines and telegraph machines has been carried out and introduces a switched-telegraph-network transmission plan based on the results.

621.394.34.

1741 A TRANSISTORIZED AIRBORNE TELEPRINTER RECEIVER. W.T.Eastwood.

Proc. Instn Elect. Engrs, Paper 2975E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 773-9, 789-92).

Republication, with discussion, of the paper abstracted in Abstr. 3760 (1959).

621.394.441

1742 APPLICATION OF TELEGRAPH TECHNIQUES IN DATA TRANSMISSION.

A.Boggs and J.E.Boughtwood.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 336-40 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

Data transmission is provided as either point-to-point service or as a multipoint service, usually private wire, for such purposes as ticket reservation. The Western Union standard practice is to divide a speech channel into two, each half carrying ten telegraph channels at 150-c/s intervals. For data transmission at 180 bauds two adjacent channels are used (the resulting channel at present being centred at 1050 c/s or 1350 c/s) whilst for transmission at 1000 bauds the entire half-channel from 300 to 1800 c/s is used. Block diagrams are given of typical point-to-point and multipoint systems and also of some of the data transmission equipment including: the 180-baud data carrier transceiver, the 1000-baud data carrier transceiver, the data loop transceiver, and the network repeater. All equipment is transistorized and errors on 180-baud circuits cause rejection of one 80-column card out of 3300; preliminary tests indicate that the error rate on the 1000-baud circuit will be about one character in 3×10^5.

G.A.Montgomerie

621.394.74

1743 TELEGRAPH DISTORTION IN THE TRUNK NETWORK OF THE TELEGRAPH AUTOMATIC SWITCHING SYSTEM. L.K.Wheeler and A.C.Frost.

Post Off. Elect. Engrs' J., Vol. 52, Pt 2, 103-7 (July, 1959).

The Telegraph Distortion Analyser described previously (see Abstr. 3673 of 1954) has been used to collect data on the service performance of the v.f. channels in the automatic telegraph switching system and a statistical analysis has been made to obtain an estimate of the quality of connections involving various numbers of channels.

621.395 : 621.396.931

1744 THE SOUTH-LANCASHIRE RADIOPHONE SERVICE. I. THE GENERAL SYSTEM. L.T.Arman. II. THE RADIO-TELEPHONE EQUIPMENT. B.Armstrong.

Brit. Commun. and Electronics, Vol. 6, No. 12, 858-60, 860-1 (Dec., 1959).

v.h.f. mobile-radio service provides communications between land mobile stations and the public telephone network. Calls between the mobile service user and both local and distant subscribers on the telephone network are possible, the calls in the latter case being routed via the trunk network.

621.395.123

1745 METERING OVER JUNCTIONS.

D.L.Heptinstall and W.A.Ryan.

Post Off. elect. Engrs' J., Vol. 51, Pt 4, 335-7 (Jan., 1959).

Trunk calls dialled by a subscriber from a local exchange that is remote from its group switching centre are charged for by sending signals over the junction from the switching centre to operate the subscriber's meter, the metering signal being transmitted by reversing the current flowing in the junction. To help ensure that the signals are inaudible to the subscribers, the line current is first reduced, then reversed and lastly restored to its normal value, the process being repeated for each meter pulse.

621.395.31

1746 APPLICATION OF PROBABILITY THEORY TO CONGESTION PROBLEMS IN TELEPHONE SYSTEMS.

F.Pollaczek.

Ann. Telecomm., Vol. 14, No. 7-8, 165-83 (July-Aug., 1959). In French.

Derivation of classical and new results for a waiting system of s trunks, fed by random input, subject to different queue disciplines (equilibrium assumed). For exponential holding time, the equations of state are solved (the corresponding loss system is also discussed) and the waiting time distribution W(t) is found for strict order servicing. For constant holding time and strict order servicing, a new approach is used; the Erlang integral equation for W(t) is derived from the Lindley queueing equation, and its solution found with the help of Laplace–Stieltjes transforms (first for $s = 1$ and then extended for arbitrary s). By inversion, a new explicit expression for W(t) is obtained, involving roots of a characteristic equation; the existence of these roots (in a circle on a complex plane) is proved. The analysis is extended to the case of arbitrary holding time and allocation servicing; formula for W(t) is given by a contour integral. For $s = 1$ simplifications are indicated and the generating function for queue length is derived. Expressions for the probability of no delay and for mean waiting time are obtained in closed form; their asymptotic expansions (under various conditions) are also given. The case of arbitrary holding time and strict order servicing is only briefly mentioned, and W(t) is given by a contour integral for $s = 2$ and for holding time assuming two possible constant lengths. For random servicing (exponential case) the results include the expression for the relevant generating function (found by contour integration) and the corresponding expression for W(t) as a trigonometric integral. 34 references.

R.Syski

621.395.341.7

1747 CONTROLLING REGISTER-TRANSLATORS. I. GENERAL PRINCIPLES AND FACILITIES.

N.Walker.

Post Off. elect. Engrs' J., Vol. 51, Pt 4, 268-71 (Jan., 1959).

The register-translator receives the digits dialled by the subscriber, determines the charging rate for the call and transmits appropriate information in the form of trains of pulses to enable the call to be routed to its destination. The facilities provided by controlling register-translators and the general principles of their design are described.

621.395.341.7

1748 CONTROLLING REGISTER-TRANSLATORS. II. ELECTROMECHANICAL REGISTER-TRANSLATORS.

A.J.Barnard, D.L.Benson and R.A.Wood.

Post Off. elect Engrs' J., Vol. 51, Pt 4, 272-9 (Jan., 1959).

Separate types of electromechanical register-translators have been designed for use in non-director and director exchange areas and both types of equipment are described. The registers and translators are constructed as separate units, one translator normally serving a group of up to 15 registers.

621.395.341.7

1749 CONTROLLING REGISTER-TRANSLATORS. III. ELECTRONIC REGISTER-TRANSLATOR USING COLD-CATHODE DISCHARGE TUBES. D.L.Benson and D.H.Vogan.

Post Off. elect. Engrs' J., Vol. 51, Pt 4, 280-90 (Jan., 1959).

Describes electronic register-translator equipment which employs cold-cathode discharge tubes using the "voltage-transfer" circuit technique. The equipment has been developed to provide subscriber-trunk-dialling facilities at larger non-director centres, and the initial installation at Bristol is of this type.

621.395.341.7

1750 CONTROLLING REGISTER-TRANSLATORS. IV. MAGNETIC-DRUM REGISTER-TRANSLATOR.

D.L.Benson and D.H.Vogan.

Post Off. elect. Engrs' J., Vol. 51, Pt 4, 291-300 (Jan., 1959).

Describes a register-translator system employing magnetic-drum storage which has been designed for use in centralized installations in director areas. In this system 47 registers and a common translator are provided by a single magnetic-drum and the associated equipment.

621.395.341.72

1751 INCOMING REGISTER-TRANSLATOR FOR DIRECTOR AREAS. H.S.Waters and S.H.Sheppard.
Post Off. elect. Engrs' J., Vol. 51, Pt 4, 303-9 (Jan., 1959).

An examination is made of the facilities required for subscriber and operator dialling to distant director areas, and the reasons for evolving incoming register-translator equipment are given. The circuit arrangements adopted to provide the required facilities are described.

621.395.35

1752 INTRODUCTION OF SEMI-AUTOMATIC OPERATION OF CONTINENTAL TELEPHONE SERVICES. M.G.Turnbull.
Post Off. elect. Engrs' J., Vol.52, Pt 2, 89-95 (July, 1959).

Following field trials of two different voice-frequency signalling systems for use between any two national telephone systems, agreement was reached through the C.C.I.T.T. on the use of these two systems. Results of field trials and the agreed signals to be used over international circuits are briefly discussed. This is followed by an outline of the equipment and trunking arrangements provided at London for semi-automatic working of the European international circuits.

621.395.361

1753 PERIODIC METERING. N.Walker.
Post Off. elect. Engrs' J., Vol.51, Pt 4, 320-3 (Jan., 1959).

The factors influencing choice of system for charging for trunk and local calls are discussed and a description is given of the method to be adopted for subscriber-dialled calls. On trunk calls the subscriber's meter is operated once when the called subscriber answers and at regular intervals throughout the call, the frequency of operation of the meter depending on the distance of the call and whether the full-rate or cheap-rate tariff is in force. The charging for local calls, which is also described, is similar to that for trunk calls.

621.395.374

1754 LOCAL REGISTER FOR DIRECTOR EXCHANGES. S.H.Sheppard.
Post Off. elect. Engrs' J., Vol. 51, Pt 4, 301-2 (Jan., 1959).

In director areas, outgoing subscriber-dialled trunk calls are controlled by register-translators at a trunk switching centre, access to these register-translators being obtained via local registers at each director exchange. The function of the local registers, which are described, is to route the call to the trunk switching centre and then to repeat into the register-translators the digits dialled by the subscriber.

621.395.374

1755 THE GENERAL PLAN FOR SUBSCRIBER TRUNK DIALLING [IN THE UNITED KINGDOM]. H.E.Francis.
Post Off. elect. Engrs' J., Vol. 51, Pt 4, 258-67 (Jan., 1959).

621.395.44

1756 A MEDIUM-DISTANCE, BUILT-IN OUT-BAND SIGNALLING, CARRIER TERMINAL EQUIPMENT. I. GENERAL PERFORMANCE REQUIREMENTS. II. DESCRIPTION OF EQUIPMENT. E.T.C.Harris and K.C.A.King.
Post Off. elect. Engrs' J., Vol. 52, Pt 2, 122-4 (July), Pt 3, 179-83 (Oct., 1959).

Some of the factors considered in the overall specification for a medium-distance carrier terminal equipment with built-in signalling facilities are discussed. In Part 2, a detailed description of an equipment which has successfully completed its field trials is given.

621.395.44 : 621.315.052.63

1757 PRACTICAL COMPUTATION OF SINGLE-FREQUENCY COUPLING LOSSES FOR REPRESENTATIVE FIELD CONDITIONS. H.J.Fiedler, F.C.Krings and D.L.Weller.
Trans Amer. Inst. Elect. Engrs III, Vol. 78, 455-61 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

Shows how the loss in a power line carrier coupling circuit varies with detuning, size of coupling capacitor and load resistance and presents the results in graphical form. An analysis of the effect of impedance mismatch and variations in the Q of the coupling circuit is included. W.A.Cameron

621.395.521.1

1758 ATTENUATION AND PHASE CONSTANT OF SYMMETRICAL HYBRID CIRCUITS. B.Hess and G.Kraus.
Nachrichtentech. Z. (N.T.Z.), Vol. 12, No. 10, 514-20 (Oct., 1959) In German.

The transmission constant of the hybrid circuit, in the stop-direction, is theoretically analysed and it is shown that, in the accurate formula, a difference of two reflection factors, (between the two-wire circuit and the terminating impedance of the four-wire circuit, and between the line balance and the terminating impedance of the four-wire circuit) should enter instead of the reflection factor between the two-wire circuit and the line balance which is taken in the commonly used approximate formula. A nomogram is given for calculating hybrid attenuation and phase constant. Practical hybrid circuits are considered, results of measurements are shown and an accurate method of calculating practical circuits is derived. Limitations of the approximate formula are discussed. J.M.Silberstein

TELEPHONE EQUIPMENT
COMMUNICATION NETWORKS AND CABLES

621.395.63

1759 QUALITY CONTROL AND QUALITY INSPECTION IN TELECOMMUNICATION.
I. INTRODUCTORY OBSERVATIONS. D.van den Berg.
II. QUALITY CONTROL AND INSPECTION OF THE TRANSMISSION EQUIPMENT. A.Boesveld.
III. QUALITY CONTROL AND INSPECTION IN TELEPHONE EXCHANGES. W.van Eijk.
Ingenieur, Vol. 71, No. 45, E.143-E.146, E.146-E.149, E.150-E.152 (Nov. 6, 1959). In Dutch.

In Pt I it is shown that absolute standards of quality must result in an exorbitant price of a telephone network. The network subscriber may obtain reasonable quality at reasonable cost if permissible tolerances are applied to these standards according to a "thesis of reasonableness" postulated. Methods of maintaining acceptable quality over a sufficiently long period are dealt with. They should be based on quality inspection. The arguments presented apply also to telegraph and telex services. In Pt II general aspects of quality control are explained by analogy with a feedback amplifier circuit. The reliability, stability and fidelity of the Dutch transmission system are then discussed, the determination of reliability on the basis of disturbance data being considered. Pt III contrasts "preventive" with "corrective" maintenance, the latter being the more modern approach and involving the rapid signalling and remedying of faults immediately they occur. G.N.J.Beck

621.395.63 : 621.395.5

1760 THE LONDON INTERNATIONAL MAINTENANCE CENTRE. K.E.Stotesbury and S.H.L.Byrne.
Post Off. elect. Engrs' J., Vol. 52, Pt 2, 96-100 (July, 1959).

With the introduction of the semi-automatic operating of continental telephone services it was necessary to define and agree, internationally, the organization required for testing and clearing faults on international circuits. The organization in each telephone administration established to perform these duties is known as the International Maintenance Centre. The organization of the London Centre and the testing equipment provided to maintain continental circuits is described.

621.395.63 : 621.316.99

PLANE/MULTIPLE/EARTHING OF TELECOMMUNICATION EQUIPMENT. See Abstr. 1307

621.395.641

1761 THE THEORY OF THE TWO-WIRE REPEATER. T.Grewe.
Arch. elekt. Übertragung, Vol. 13, No. 6, 243-52 (June); 297-302 (July, 1959). In German.

The transformation of a symmetrical quadripole into its equivalent bridge circuit devised by Bartlett and Brune is expanded to cover quadripoles with transfer-asymmetrical halves. If the expanded transformation is used for the two-wire repeater with one

amplifier for the go and one for the return direction, a two-wire repeater is obtained with two negative impedances in a bridge circuit. These two negative impedances are each generated by an amplifier that is made regenerative by way of a bridge circuit. General relationships are derived for this basic circuit which can be applied not only with two-wire repeaters and negative impedances, but also with degenerative amplifiers and oscillators. The scatter matrix is used for stating the linear sets of equations. The stability problem occurring with two-wire lines with several amplifiers is solved with a new method, in which the overall circuit is broken down into a number of individual unstable sections.

621.395.65 : 621.395.374

1762 LAYOUT OF CHARGING GROUPS AND REARRANGEMENT OF LINE PLANT AND SWITCHING EQUIPMENT FOR SUBSCRIBER TRUNK DIALLING. D.Breary and L.W.J.Chilver.
Post. Off. elect. Engrs' J., Vol.51, Pt 4, 353-9 (Jan., 1959).

Details are given of some of the factors taken into account when arranging the exchanges in the United Kingdom into about 640 charging groups in preparation for subscriber trunk dialling, and the changes necessary to the trunking of junction tandem exchanges are discussed

621.395.66 : 621.395.31

1763 A PORTABLE EQUIPMENT FOR ANALYSING TRAFFIC AT NON-DIRECTOR AUTOMATIC TELEPHONE EXCHANGES. K.Myers and P.H.Skinner.
Post Off. elect. Engrs' J., Vol. 52, Pt 3, 176-8 (Oct., 1959).

A new portable equipment, known as a route analyser, enables the telephone calls carried by a junction route from a non-director automatic telephone exchange to be analysed by recording on meters the number of times each terminal-exchange code is dialled. In conjunction with the information about the total traffic on a junction route, the traffic to each terminal exchange can be calculated.

621.395.66 : 621.395.364

1764 THE ELECTRONIC TRAFFIC ANALYSER — A SURVEY OF ITS USE AND LIMITATIONS. H.T.McGrath.
Post Off. elect. Engrs J., Vol. 52, Pt 1, 19-25 (April, 1959).

The use made of the electronic traffic analyser since it was first constructed is reviewed, and a number of changes made to increase the flexibility and reliability of the analyser are described. Extensive tests have been made of gradings of different availabilities, formations and numbers of trunks, and the traffic capacity of various alternative-routing schemes has been investigated. The considerable flexibility of the analyser has enabled a great variety of other problems to be investigated and some of these are briefly described. For tests on more complicated trunking schemes than were originally envisaged in the design of the machine, some limitations have become apparent; these are discussed and the desirable features of a new machine are propounded.

621.395.66 : 621.395.374

1765 THE FIRST SUBSCRIBER-TRUNK-DIALLING INSTALLATION—AT BRISTOL.
A.E.Woods, W.Rangecroft and W.A.Humphries.
Post. Off. elect. Engrs' J., Vol.51, Pt 4, 360-8 (Jan, 1959).

On 5 December 1958 the first subscriber-trunk-dialling equipment in the United Kingdom was brought into use, enabling Bristol Central exchange subscribers to dial their own calls to subscribers served by 427 other telephone exchanges in various parts of the country. Details are given of the equipment installed and its planning, installation and testing.

621.395.66 : 621.395.374

1766 PHYSICAL DESIGN OF SUBSCRIBER-TRUNK-DIALLING EQUIPMENT. H. Banham.
Post Off. elect. Engrs' J., Vol. 51, Pt 4, 310-19 (Jan., 1959).

The method used for mounting the registers, translators and other equipment being provided for subscriber trunk dialling are described, and details are given of the novel forms of construction used for the electronic register-translators and other items to ensure that they function satisfactorily and are readily accessible.

621.395.66 : 621.395.374

1767 MAINTENANCE ASPECTS OF SUBSCRIBER TRUNK DIALLING. G.Spears, S.Rudeforth and M.C.Stone.
Post Off. elect. Engrs' J., Vol. 51, Pt 4, 369-72 (Jan., 1959).

621.395.663.6

1768 THE PAY-ON-ANSWER COIN-BOX SYSTEM. F.J.Bastow, J.D.Collingwood, E.Newell and C.K. Price.
Post. Off. elect. Engrs' J., Vol.51, Pt 4, 343-52 (Jan., 1959).

621.395.664 : 621.395.361

1769 PULSE-GENERATING AND TARIFF-CONTROL EQUIPMENT FOR PERIODIC METERING.
P.S.Russell, B.D.Gorton, A.L.Lumber and W.S.Cumming,
Post. Off. elect. Engrs,J, Vol.51, Pt 4, 324-31 (Jan., 1959).

Describes the mechanical design of the pulse generator and the equipment for automatically changing the tariff rates on calls controlled by register-translators. The pulse supplies for local-call timing are required at every local exchange and are generated by a separate unit, a description of which is also given.

621.395.664 : 621.395.366.3

1770 SUBSCRIBERS' PRIVATE METER EQUIPMENT. F.Gresswell, J.L.Belk and G.A.Alderson.
Post Off. elect. Engrs' J., Vol. 51, Pt 4, 338-42 (Jan., 1959).

Detailed telephone accounts will be replaced by bulk-billing when subscriber trunk dialling is introduced, and to give subscribers the equivalent of the Advise Duration and Charge (A.D.C.) facility, private meters may be provided at their premises on a rental basis. These meters will register the total chargeable units and also the units chargeable for the last call, or series of calls, made. The method of signalling meter information from the main exchange to the subscribers' premises is described and also the development of the types of meter to be used on individual exchange lines and at private branch exchanges.

621.395.664 : 621.395.361.1

1771 LOCAL-CALL TIMERS. D.R.B.Ellis and B.D.Gorton.
Post. Off. elect. Engrs,J., Vol.51, Pt 4, 333-4 (Jan., 1959).

The local-call timers described have been designed to enable periodic metering to be used on local calls made by subscribers connected to non-director and director exchanges. In addition, the equipment for director exchanges allows the periodic metering pulses on trunk calls to be relayed through the 1st code selector to the subscriber's meter.

621.395.665.1

1772 A COMPANDOR USING JUNCTION TRANSISTORS. D.Thomson.
Proc. Instn Elect. Engrs, Paper 2868 E [International Convention on Transistors and Associated Semiconductor Devices], publ. May, 1959 (Part B Suppl. No. 16, 619-24, 633-6).

Republication, with discussion, of the paper abstracted in Abstr. 3139 (1959).

621.395.721.4

1773 THE NEW 700-TYPE TABLE TELEPHONE — TELEPHONE No. 706. H.J.C.Spencer and F.A.Wilson.
Post Off. elect. Engrs' J., Vol. 52, Pt 1, 1-12 (April, 1959).

Describes an entirely new table telephone incorporating the 700-type transmission circuit. The new instrument is made in a wide range of colours using advanced constructional techniques, including printed wiring. It incorporates an automatic sensitivity regulator, shown to be necessary by trials with the prototype.

621.395.722

1774 AN EFFICIENT ELECTRONIC SWITCH — THE BOTHWAY GATE. J.A.T.French and D.J.Harding.
Post Off. elect. Engrs' J, Vol. 52, Pt 1, 37-42 (April, 1959).

A simple non-mathematical explanation is given of an efficient and symmetrical form of pulse amplitude modulation applied to time-division-multiplex transmission in an electronic telephone exchange.

621.395.741 : 621.391.823

1775 METHOD TO SIMULATE POWER INDUCTION ON TELECOMMUNICATION CABLES, PARTICULARLY WITH INSULATED METAL SHEATHS. E.Widl.
Arch. elekt. Übertragung, Vol. 13, No. 9, 363-71 (Sept., 1959).
In German.

Equal longitudinal voltages in sheath and cable conductors are induced artificially, at the centre of an exposed section, by means of an inverted through-type current transformer. Resulting currents and voltages to earth are calculated and compared with those arising from equivalent natural induction. Measurements of

the screening factor of the cable sheath, the sensitivity coefficient of pairs in the cable and the earthing factor are described, and the effect of the earthing resistance of the sheath is shown.

H.R.J.Klewe

621.395.741

1776 SYNTHETIC POLYMERS FOR CABLE INSULATION. H.M.Weber.

Bull. Assoc. Suisse Elect., Vol. 50, No. 23, 1109-14 (Nov. 7, 1959) In German.

The properties of various synthetic rubbers, polythene and P.V.C. are presented in a convenient form for reference purposes

V.G.Welsby

621.395.741 : 621.395.44

1777 EFFECT OF TEMPERATURE ON THE ATTENUATION OF BALANCED PAIR CABLES FOR CARRIER CURRENTS. M.C.Fouilleul.

Cables et Transm., Vol. 13, No. 1, 16-25 (Jan., 1959). In French.

Describes measurements of the attenuation-temperature coefficient of 60-channel and 24-channel, paper-covered quad. cables as a function of frequency. Measurements at 240 kc/s over the temperature range 2-50°C show a constant temperature coefficient in each case. The attenuation-temperature coefficient of the 60-channel cable is plotted over the range 12-240 kc/s and that for the 24-channel cable over the range 12-140 kc/s.

W.A.Cameron

621.395.741

1778 DESIGN OF POLYETHYLENE-INSULATED MULTIPAIR TELEPHONE CABLE. A.S.Windeler.

Elect. Engng, Vol. 78, No. 10,1030-3 (Oct., 1959).

Discusses the factors to be taken into account in choosing the design. The main problem is that of fixing the conductor size and thickness of insulation to give the required d.c. resistance and capacitance.

V.G.Welsby

ELECTROACOUSTIC APPARATUS

621.395.6 : 534.84

1779 MEASUREMENT OF THE ACOUSTIC CHARACTERISTICS OF A 'DEAF' (DEAD, ANECHOIC) ROOM. B.Karafakioglu.

Ann. Telecomm., Vol. 14, No. 5-6, 129-34 (May-June, 1959). In French.

After outlining the requirements which should be fulfilled in the acoustics of an anechoic (sourde) room, a description is given of the construction of such a room at the technical University of Istanbul and the measurements which have been made to verify the distribution of the acoustic field in it. A determination has also been made, by a new method, of the time of reverberation at different frequencies in the range 125 to 4000 c/s.

A.B.Wood

621.395.6 : 534.84

1780 EXPERIMENTS IN THE MEASUREMENT OF [SOUND] INSULATION [OF WALLS] IN SITU. A.C.Raes.

Ann. Telecomm., Vol. 14, No. 9-10, 210-17 (Sept.-Oct., 1959). In French.

Results are given of a large number of measurements which have been made in various buildings to determine the acoustic insulating quality of the walls and partitions. After describing the method of measurement employed, results are compared with those obtained by "classic" laboratory methods. It is indicated how the "in situ" method reveals faults in construction, and its importance in estimating the acoustic qualities of buildings is emphasized.

A.B.Wood

621.395.6 : 621.396.967

1781 THE SUBJECTIVE EFFECT OF LIMITING THE UPPER AUDIO-FREQUENCY RANGE. D.E.L.Shorter, W.I.Manson and E.R.Wigan.

E.B.U. Rev. A, No. 57, 22-8 (Oct., 1959).

There is an economic limit to the band-width obtainable in the programme distributing lines used for national broadcasting. The B.B.C. have conducted an investigation involving over 4500 tests in order to study the effects of limiting the bandwidth to 12 kc/s, 10 kc/s and 7 kc/s (with a less sharp cut-off). The difficulties and limitations of such tests are discussed. A description is given of the exact test procedure and the apparatus involved. Details of the analysis and presentation of results are given. The music and speech programme selections used were chosen as being most likely to show the effects of high frequency cut-off. Results from experienced and inexperienced observers were analysed separately. A cut-off at 12 kc/s was found to be perceptible to only a few critical observers; a cut-off at 10 kc/s or less was readily detectable by experienced listeners and was also perceptible to a number of inexperienced observers.

M.L.Gayford

621.395.6 : 534.81

1782 THE USE OF THE "SONOGRAPH" IN THE DETERMINATION OF THE QUALITY OF STRINGED INSTRUMENTS. E.Leipp and A.A.Moles.

Ann. Telecomm., Vol. 14, No. 5-6, 135-42 (May-June, 1959). In French.

The characterization and appreciation of musical instruments depends on a comparison of the subjective aspects of the sound perceived by the ear and the objective elements of the sound phenomenon produced by the instrument. The "sonograph" or acoustic spectrometer, gives a direct representation of the form of the "sound object" furnished by the instrument. The paper describes an investigation of the sound emitted by violins under varied conditions of excitation (bowing, string tension etc.) and damping.

A.B.Wood

621.395.61

1783 MICROPHONE DISTANCE AND SOUND PERSPECTIVE. E.Briner-Aimo.

Ann. Telecomm., Vol. 14, No. 9-10,218-19 (Sept.-Oct., 1959). In French.

Whilst the art of microphone placement is necessarily largely an empirical one, the author suggests that charts based on the analysis of the proximity effect for simple gradient microphones and on the level of reverberant sound calculated from the usual formulae can be helpful in estimating the acoustic quality likely to be obtained for various studio conditions.

M.L.Gayford

621.395.61 : 621.396.97

1784 THE STEREO DIRECTION MIXER. K.Bertram.

Elektron. Rdsch., Vol. 13, No. 10, 367-71 (Oct., 1959). In German.

Such a mixer is required when several pairs of microphones (one omni-directional and the other figure-of-eight) are employed at different positions as in the case of a full orchestral recording or broadcast. The mixing regulator is intended to control the difference (left–right) channel of a double-microphone so that, not only the actual direction, but also the directional "sharpness", can be varied. The mixer consists of a symmetrical resistance bridge, each arm being made up of eight elements, and the sum component is connected to one pair of diagonals while the difference component is fed to the other. The application of this type of mixer, one of which is required for each pair of microphones, is described in detail.

H.G.M.Spratt

621.395.62

1785 PIEZOELECTRIC AND MAGNETOSTRICTIVE ELEMENTS. R.E.Fischbacher.

Control, Vol. 2, No. 15, 104-108 (Sept., 1959).

The electromechanical coefficients of crystalline and ferroelectric ceramics are reviewed and the principle coefficients of a few materials tabulated. The derivation of the electromechanical coupling coefficient is explained and the significance of the different sound velocities in the various materials pointed out. Types of application, frequency ranges and methods of mounting of the different transducers are discussed. Brief reference is made to bimorph crystals and to the hysteresis effect shown by ferroelectric materials which has applications in information storage.

H.G.M.Spratt

621.395.62

1786 THE DEVELOPMENT AND APPLICATION OF SYNTHETIC REVERBERATION SYSTEMS. L.S.Goodriend and J.H.Beaumont.

J. Audio Engng Soc., Vol. 7, No. 4, 228-34 (Oct., 1959).

Traces the historical and engineering development of synthetic reverberation systems from the echo chamber and acoustical and electromechanical devices to the modern re-entrant magnetic tape reverberation generator. The use of multiple heads with electronic re-entry and the need for nonintegral spacing of heads and extremely uniform electronic frequency response in magnetic tape systems are analysed.

621.395.623.64

1787 MEASURING HEADPHONES AND THEIR TRANSMISSION CONSTANTS. H.Mrass and P.Bocker.
Z. InstrumKde, Vol. 67, No. 9, 235-41 (Sept., 1959).

Objective and subjective measurements on headphones are described; the importance of a coupler to such measurements is pointed out. The influence of leakage and positioning error on the reproducibility of these results is also discussed.

621.395.623.7

1788 A COMPACT, SINGLE-CABINET, STEREOPHONIC SPEAKER SYSTEM.
S.E.Levy, G.W.Sioles and V.Brociner.
J. Audio Engng Soc., Vol. 7, No. 4, 217-22 (Oct., 1959).

A loudspeaker design is described, utilizing reflections from the walls of the listening room to provide broad virtual sources with good separation. Deflector baffles in the form of doors are used to reduce the sound reaching the listener directly from the speakers. The sound fields so created are continuous, and thus provide good "centre fill" without additional speakers. Frequencies below 150 c/s from both channels are reproduced by one dual voice-coil woofer, of high-compliance design.

621.395.623.7

1789 INTERACTION OF LOUDSPEAKERS IN AN ENCLOSED BAFFLE BOX. M.Vlček.
Slaboproudy Obzor, Vol.20, No.10, 622-6 (1959). In Czech.

An acoustic enclosure in the form of a parallelepiped and containing two loudspeakers is considered. For the purpose of analysis it is assumed that the walls of the enclosure are rigid and act as ideal reflectors. The loudspeakers are represented by circular vibrating diaphragms. The problem consists of determining the total input impedance of the enclosure in the plane of each diaphragm. An expression for the input impedance is derived; this is a function of the dimensions of the enclosure and the loudspeakers and their position relative to the walls. The effect of the position of the diaphragms on the impedance is analysed. It is also shown that, by employing the principle of superposition, formulae for the impedance can be extended to enclosures with four or more loudspeakers.

R.S.Sidorowicz

621.395.623.8

1790 MODERN PUBLIC ADDRESS TECHNIQUE. H.Petzoldt.
Frequenz, Vol. 13, No. 12, 385-90 (Dec., 1959). In German.

The properties and applications of directional column loudspeakers are discussed. The fall-off of sound pressure on the axis with distance is examined; the outputs of the various diaphragms are not exactly in-phase near to the column but are more nearly so at greater distances. The net effect is that pressure falls at a lower rate than the usual inverse-distance law, giving a more uniform sound coverage on the axis. Other advantages of columns are firstly, that the bass response is improved because each diaphragm helps to offset the natural low-frequency fall in the radiation-resistance load experienced by neighbouring diaphragms and secondly, that by placing a microphone on a "dead" axis of the loudspeaker, the proximity of the microphone to the loudspeaker can be drastically reduced without any risk of acoustic feedback. Reverberation is also reduced due to the directional response, it being estimated that the radial distance from a loudspeaker indoors at which adequate intelligibility is achieved may be increased by 65%. Magnetic-recording time-delay systems are briefly described and some stereophonic reproducing systems in halls and in the open air are reviewed. M.L.Gayford

621.395.625 : 621.317.39

1791 MEASUREMENT OF WOW BY MEANS OF A FLUCTUOMETER. G.Lubszynski.
Ann. Telecomm., Vol. 14, No. 7-8, 154-6 (July-Aug., 1959). In French.

The method of measurement, which is equally applicable to disk, tape or film, consists in recording a constant signal of about 3 kc/s and measuring the percentage fluctuation and the instantaneous deviation of the playback signal. The former is measured on a indicating meter; the latter on a c.r.o. The "carrier" frequency can range from 2.85 to 3.15 kc/s and accuracy is unaffected by amplitude modulation up to ±2 dB. In the instrument, the playback signal is first amplified and then passed (a) to a discriminator and (b) to a 90° phase shifter. The two outputs are mixed and demodulated to give a final output signal whose amplitude and frequepcy are proportional to the amplitude and frequency of the fluctuation. There are two ranges for each measurement, 0 to ±1% and 0 to ±0.3% for instantaneous deviation and 0.2-2.0% and 0.06-0.6% for fluctuation. Accuracy generally is within 1 dB. H.G.M Spratt

621.395.625.2 : 621.373.52

1792 VERSATILE F.-M. TRANSDUCER. C.S.Burrus.
Electronics, Vol.32, No.46, 79 (Nov. 13, 1959).

A displacement-sensitive gramophone pick-up has been made by mounting a transistor oscillator on the pick-up arm. The stylus varies the capacity of the tank circuit, so that the oscillation is frequency-modulated. The response is flat from 30 to 15000 c/s. Other applications of such an oscillator are suggested. D.E.Rae

621.395.625.2

1793 RECENT DEVELOPMENTS IN STEREO DISC RECORDING. J.G.Frayne and R.R.Davis.
J. Audio Engng Soc., Vol. 1, No. 4, 147-52 (Oct., 1959).

Describes an analogue computer analysis made to determine the cause of resonances in the upper high-frequency response of the Westrex StereoDisk cutter, and the mechanical modifications which were made in accordance with the solution suggested by the computer. The result is a smooth response to the least 15 kc/s verified by actual recordings. The design and application of the electromagnetic device which automatically controls depth of the groove in accordance with the pitch, being actuated from the pitch control mechanism of the Scully recorder, is also described. Included also is a description of a study of contemporary stereo disk pickups with regard to frequency response and crosstalk between channels.

621.395.625.2

1794 A NEW STEREO FEEDBACK CUTTERHEAD SYSTEM. R.Narma and N.J.Anderson.
J. Audio Engng Soc., Vol. 7, No. 4, 153-9 (Oct., 1959).

Describes the development of a high-quality stereophonic feedback disk cutter system. Design objectives and the advantages and disadvantages of various electromechanical motors are given. A simple single armature double moving-coil design is explored in detail showing the problems in achieving adequate frequency response, sensitivity and separation. The requirement of low effective mass of the moving armature to achieve high recorded velocities at high frequencies is indicated. The basic design of the magnetic system with four gaps is also described. A new unique r.f. transducer system is described, being displacement-responsive and free from inductive couplings to the motor windings. Since in musical recordings high peak velocities are required for short periods of time, considerable power is required to drive an inertia-controlled armature. A new high-power (400 VA) amplifier using ceramic output tubes was designed. The basic description of this amplifier and its phase corrective networks is included. It is shown how the complete system can produce high-level recordings with low distortion and good separation over the 20 c/s to 15 kc/s.

621.395.625.3 : 389.16

1795 MAGNETIC SOUND RECORDING ON FILM.
Brit. Kinematogr., Vol. 35, No. 4, 88-92 (Oct., 1959).

Refers to the recently published BS.3154: 1959 which is concerned with the relevant recording characteristic. It describes methods of measurement of surface induction of recorded magnetic coatings in lieu of the description which was included as an appendix to the draft B.S. but subsequently omitted. The method of absolute measurement of surface induction, using a non-magnetic head, is extremely difficult and is not described. Instead, the well-known short-gap and long-gap method, by means of which relative recorded levels are determined, is explained.

H.G.M.Spratt

621.395.625.3

1796 HIGH-DENSITY RECORDING ON MAGNETIC TAPE. A.Gabor.
Electronics, Vol. 32, No. 42, 72-5 (Oct. 16, 1959).

Three weaknesses exist in normal high-density recording, pulse crowding, i.e. pulse merging, due to poor h.f. response of the system, inter-channel time displacement and information dropout. These weaknesses are largely eliminated by means of a self-clocking technique. Continuous clock pulses marking the boundaries of the bit cells are combined with data pulses, delayed by a ½-cell interval, and fed to the recording amplifier via a flip-flop stage, giving a current reversal for each pulse. On playback, shaping, clipping and

gating circuits extract the data from the clocking signals. A circulating buffer system eliminates inter-channel time displacement. A longitudinal density of 1500 bits/in. and lateral density up to 25 tracks/in. are possible. H.G.M.Spratt

621.395.625.3

1797 REPRODUCTION OF MAGNETIC TAPE RECORDINGS BY MEANS OF THE HALL EFFECT.

F.Kuhrt, G.Stark and F.Wolf.

Elektron. Rdsch., Vol. 13, No. 11, 407-8 (Sept., 1959). In German.

Describes a playback head utilizing this effect. The most promising material is indium antimonide, a semiconductor with no noise components except Nyquist noise and a high electron mobility. The head is made up of a sheet of this material about 0.5×10^{-3} in thick held between two ferrite plates and so forming the "air-gap". A current of about 50 mA is passed through the sheet in a transverse direction with respect to the tape movement and the Hall voltage then appears across top and bottom of the sheet. Experimental heads show an open-circuit output voltage of 500 μV and a noise voltage of less than 0.2μV. The output is essentially proportional to surface induction and not to its derivative, so giving a more or less flat frequency characteristic up to the point where the "air-gap" effect appears. An application of this device is described in the following abstract. H.G.M.Spratt

621.395.625.3

1798 CUTTING TECHNIQUE FOR VIDEO TAPES. H.Friess.

Elektron. Rdsch., Vol. 13, No. 11, 414-15 (Sept., 1959). In German.

Deals only with the Ampex system of television recording. Three Three separate equipments are required: (1) the video finder; (2) the Synchrocord; and (3) the cutter and splicer. The video finder is attached to an Ampex machine and enables the exact spot where the cut is required to be marked on the cue track. For this purpose a magnetic disk driven from the tape provides a temporary store for the marking signal which, after fine adjustment, is transferred to the cueing track. The Synchrocord is a recording equipment with two synchronized drives; (1) for the video tape which is passed over a conventional playback head, and (2) a sprocket drive for 16 mm magnetically coated film. Here the sound and the cueing signals can be transferred backwards and forwards as required from video tape to film so that exact synchronism after cutting can be guaranteed. The cutting and splicing machine is but briefly described. An interesting feature is the inclusion of a Hall-effect head (see preceding abstr.). H.G.M.Spratt

621.395.625.3 : 538

1799 MAGNETIC RECORDING HEAD WITH D.C. RESPONSE. R.E.Fischell and S.J.Meehan.

J. appl. Phys., Supplement to: Vol. 30, No. 4, 246S-247S (April, 1959).

A magnetic recording head has been developed to directly record and play back low-frequency signals, down to and including zero c/s, without using amplitude, frequency, or pulse width modulation. Two problems are encountered in d.c. magnetic recording. The more obvious problem is caused by the small voltage induced in the playback head when the flux changes at a very slow rate. At low frequencies, the output of a conventional playback head is proportional to the time rate of change of flux in the head; therefore, at d.c. the playback signal has zero amplitude. The second problem encountered in reproducing d.c. signals is the disappearance of the magnetic field at the gap of a ring-type head when wavelengths of considerable lengths are recorded on the tape. The magnetic field at the gap of a ring-type head becomes too small to be used when a recorded wavelength is longer than a few inches. Combining a perpendicular head with flux sensitive playback has eliminated these two problems. A perpendicular head magnetizes the recording tape perpendicularly to the direction of tape motion, i.e., the tape is magnetized through its thickness. The pole pieces of the head are spring loaded and pressed against the tape to maintain consistent contact while the tape passes through the head. Vicalloy, in the form of a thin, homogeneous metal tape, was selected for this purpose because it contains many of the magnetic and physical characteristics desired, including a high coercive force, high remanence, and mechanical flexibility when it is rolled into a thin tape. A frequency response of d.c. (0 to 10 c/s) is achieved at a tape speed of 0.027 in./sec. Pre-emphasis is not required in recording and equalization is not used during playback. Cross talk between adjacent heads in a multichannel system is below 50 dB at moderate track separations.

621.395.625.3

1800 DETERMINATION OF THE RECORDING PERFORMANCE OF A TAPE FROM ITS MAGNETIC PROPERTIES. I.Levine and E.D.Daniel.

J. Audio Engng Soc., Vol. 7, No. 4, 181-8 (Oct., 1959).

A method has been developed for measuring two anhysteretic magnetic constants of the oxide coating. The coating thickness and the recording gap length are the only additional parameters necessary to determine the absolute bias for maximum output and the absolute recording sensitivity expressed as the ratio of remanent induction in the coating to field strength deep in the recording gap.

621.395.625.3

1801 MAGNETIC CHARACTERISTICS OF RECORDING TAPES AND THE MECHANISM OF THE RECORDING PROCESS. J.G.Woodward and E.Della Torre.

J. Audio Engng Soc., Vol. 7, No. 4, 189-95 (Oct., 1959).

The magnetic characteristics of recording tapes are described in terms of a 3-dimensional distribution function based on the characteristics of the individual particles comprising the recording medium. The distribution function also includes the effects of particle interaction. Measured distribution functions for two quite different recording tapes are shown. They demonstrate that particle interaction is highly significant. It is shown that the usual audio practice of recording with superimposed signal and high-frequency bias fields is completely dependent on particle interaction for its operation. Measured distribution functions are used to compute the recording response for the two tapes. The computed curves are in agreement with recording experience in showing an increasing loss of high-frequency signal as the bias level is increased. This phenomenon as well as differences in response determined by the different composition of the two recording tapes may be understood in terms of the distribution function. The distribution function method offers a new approach to the analysis of the recording process, and suggests that magnetic material of the recording medium may be used more effectively than is the case at present.

621.395.625.3

1802 THE NOISE IN MAGNETIC RECORDING WHICH IS A FUNCTION OF TAPE CHARACTERISTICS. P.Smaller.

J. Audio Engng Soc., Vol. 7, No. 4, 196-202 (Oct., 1959).

A signal which is recorded on magnetic tape undergoes a change in amplitude and frequency before it appears at the output of the recording-reproducing system. The magnitude of the change can be determined by measuring the a.m. and f.m. sidebands which are generated in the process of recording and reproducing. The tape, as well as the transport design, will influence the sideband amplitude. It is possible to predict the degree of amplitude modulation a recorded signal will exhibit by measuring the d.c. magnetization tape noise.

621.395.625.3

1803 MAGNETIC TAPE RECORDING WITH LONGITUDINAL OR TRANSVERSE OXIDE ORIENTATION. F.R.Dubbe.

J. Audio Engng Soc., Vol. 7, No. 4, 203-6 (Oct., 1959).

A comparison of the performance of magnetic tape when the recording field is in the same direction as, or perpendicular to, the oxide particles as encountered in magnetic disk or video recording.

621.395.625.3

1804 EVOLUTION OF A SUCCESSFUL SPRING-DRIVEN, BROADCAST-QUALITY TAPE RECORDER. A.C.Travis, Jr.

J. Audio Engng Soc., Vol. 7, No. 4, 207-12 (Oct., 1959).

The intricacies of adapting spring gramophone motors to tape transport applications and the use of subminiature dry-battery record–reproduce amplifiers are discussed. The characteristics of flyweight governors, a transport wherein the take-up drive is inherent in the tape drive, effects of curved tapes on open flange winding, a mechanical wow and flutter filter, and a method of judging the frequency response fidelity of any given microphone–amplifier combination are also described.

621.395.625.3

1805 STEREOPHONIC SOUND FOR THE VIDEOTAPE RECORDER. R.H.Snyder.

J. Audio Engng Soc., Vol. 7, No. 4, 213-16 (Oct., 1959).

The Videotape recorder, now the American standard machine for local clock-time rectification of network programmes, required

the addition of stereophonic record and playback facilities. The manner in which this was accomplished is described, and the performance attainments revealed.

621.395.625.3

1806 ON THE PENETRATION EFFECT IN MAGNETIC RECORDING. V.A.Geranin.

Radiotekhnika, Vol. 14, No. 10, 73-5 (Oct., 1959). In Russian.

An account of experiments undertaken with the object of establishing whether the depth of penetration of magnetization into the tape depends on the wavelength of the record on the tape, or on the frequency of the recorded signal. For signal frequencies up to 6 kc/s it is concluded that the penetration effect depends on the spatial wavelength in the tape, and is independent of the signal frequency. F.Quelon

621.395.625.3

1807 DESIGN OF A VERTICAL MAGNETIC RECORDING HEAD WITH LARGE-SCALE MODELS. J.T.Smith.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 357-62 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

The head consists of a coil surrounding a straight mumetal core (the probe) and an end shield made up of two semicircular plates with a gap between them. The models were scaled up × 40 full size and the pick-up loop, used to plot the field distribution from the head, consists of a 100-turn coil on a 0.012 in. dia. core. Families of curves show the field strength v. distance measured from the probe centre at various frequencies and for mumetal and Swedish-iron probes. Similarly, the field distribution is shown for heads mounted off magnetic recording material coated on to an aluminium and a mumetal backing with various spacings between the probe and the inner edges of the shields. Good agreement between calculated and test figures was obtained. H.G.M.Spratt

RADIOCOMMUNICATION

621.396.2/.5

1808 AN EXPERIMENTAL STUDY OF LONG DISTANCE TROPOSPHERIC V.H.F. PROPAGATION WITH DOUBLE RECEPTION. A.V.Prosin, I.P.Levshin and G.I.Slobodenyuk.

Radiotekhnika, Vol. 14, No. 10, 3-14 (Oct., 1959). In Russian.

Describes the nature of the 275 km route in the central part of European U.S.S.R., the 10 cm spatial diversity receiving aerials, and the pulse receiver equipment used for studying, during 91 sessions from 29 May to 19 September 1958, the statistical properties of the received signals, including the mean field strength, the loss in aerial gain, the linear and two-dimensional distributions of instantaneous signal level over short periods (20 sec to 720 sec), the correlation coefficient for diversity reception, and the pulse length distribution. The errors are discussed. It is concluded that the data can be used for planning long distance tropospheric v.h.f. links in general, the agreement between experiment and theory being good enough to allow of extrapolation for other frequencies and lengths of route. D.E.Brown

621.396.41 : 621.398

1809 MULTIPLEXING TECHNIQUES FOR SATELLITE APPLICATIONS. O.B.King.

Electronics, Vol. 32, No. 44, 58-62 (Oct. 30, 1959).

The 10-channel equipment described has 8 information channels. Fixed levels are applied to the other 2 channels, one of which may by used as a synchronous pulse for a ground demultiplexer. A timing oscillator drives a decade ring counter by which the channel gates are controlled. Each counter stage uses a p–n–p and an n–p–n transistor, with two stable states in which both transistors are either on or off. A common emitter resistor is used for the p–n–p transistors, and another for the n–p–n transistors. The emitter currents of the on stage develop biasing voltages for the off stages, giving economy of current and improved stability. The timing oscillator is of the relaxation type and uses a unijunction transistor. The reference voltage applied to one channel is supplied by a series regulator controlled by a breakdown diode. The gates use inhibited common-base transistors, the power required to switch the gate being supplied by the signal. The inhibiting voltage is provided by the counter. Another counter is used to convert random pulses, e.g. from a radiation counter, to an analogue voltage, thus avoiding the errors that would arise with direct feed to the multiplexer. The outputs of the counter stages are added, weighting resistors being used to provide the proper quantum levels. To handle the outputs of variable-impedance transducers such as thermistors, a sub-carrier oscillator is used. The capacitance branch of the tank circuit is split and the transducer is connected across one part. It then controls the current in the capacitive branch. The alternating voltages produced are passed through a multiplexer with bilateral gates. W.G.Stripp

621.396.62

1810 CORRELATION BETWEEN FADING SIGNALS. INSTRUMENT FOR DETERMINING CORRELATION COEFFICIENT. J.Bell.

Electronic Technol., Vol. 37, No. 1, 36-40 (Jan., 1960).

Simple resistance-capacitance circuits enable the positive rectified fading signals, obtained at the outputs of two conventional radio receivers, to be made to fluctuate about zero. The instantaneous sum and the instantaneous difference of the fluctuations are then separately squared, smoothed, and displayed continuously on pen recordings. The correlation coefficient R can then be estimated quickly from these recordings. Circuit details are given, together with tests indicating that errors in R exceeding ±0.1 should not occur.

TRANSMITTERS . RECEIVERS

621.396.61/.62

1811 U.H.F. DISTRESS BEACON (TH.C. 985/986). G.Mayenc.

Rev. tech. C.F.T.H., No. 31, 31-41 (Sept., 1959). In French.

The transmitter–receiver described is partly transistorized, weighs 450 g with a volume of 300 cm^3. Carrier power is 40 mW and a range of over 100 km, to a search aircraft, is possible with automatic keyed carrier operation. Ranges of 50 km are obtained when used for voice communications. The supply battery, which is activated by sea water, has weight and volume of 300 g and 300 cm^3 resp. and gives 13 hr continuous service. Construction and circuits are described. A.Reiss

621.396 . 611.1 . 621.394

STUDY OF THE INFLUENCE OF THE OSCILLATOR VALVE CHARACTERISTIC ON THE TELEGRAPH SIGNAL SPECTRUM.

See Abstr. 1739

621.396.62

1812 RADIO ASTRONOMY AND THE DEVELOPMENT OF RECEIVERS WITH GREATLY INCREASED SENSITIVITY. J.L.Pawsey and F.F.Gardner.

Proc. Instn Radio Engrs Australia, Vol.20, No.9, 528-34 (Sept., 1959).

New low-noise receiver first stages are surveyed. Details are given of the Sydney maser which is based upon a ruby, and has a pump frequency of 11 kMc/s and amplifies at 1400 Mc/s. The crystal-diode and electron-beam forms of parametric amplifier are described. In order to benefit from the low noise factor of these devices it is essential that their component parts, and the feeder systems used with them, should be of low-loss construction and consequently quiet. Experimental performance data are given for a number of devices, the travelling-wave forms being the best. W.T.Blackband

621.396.621 : 621.372.54

1813 AUTOMATICALLY TUNED FILTERS USING REACTANCE VALVES FOR PANORAMIC RECEPTION. N.I.Svetlov.

Radiotekhnika, Vol. 14,, No. 9, 45-56 (Sept., 1959). In Russian.

The dynamic range of a panoramic receiver can be increased by means of electronically tuned filters with valves as reactive elements and using two phase-shifting stages in a broadband channel. An experimental verification on a single-stage filter shows agreement with theory. The static and dynamic amplitude–frequency characteristics are linear. A two-stage filter was also designed and tested; in this case the dynamic range of the receiver was increased severalfold. The engineering approach to the problem is outlined. Z.F.Voyner

621.396.621

1814 THE ACTION OF A STRONG INTERFERING SIGNAL AT A RADIO RECEIVER INPUT. L.M.Kononovich.
Radiotekhnika, Vol. 14, No. 11, 21-7 (Nov., 1959). In Russian.

Starts from the approximation to the grid characteristic : $i_a = I_a[1 + \tanh(Su_g/I_a)]$ where I_a = anode current at u_g = O, S = slope at u_g = O, and analyses the effect on the input stage (r.f. amplifier or mixer) of strong sinusoidal interference with a frequency lying in the receiver pass-band. Practical rules are laid down for choosing the valve type and operating conditions to ensure maximum noise immunity. It is shown that with suitable choice of the operating conditions the s./n. ratio at the output can exceed the s./n. ratio at the input. Experimental verification of some of the theoretical curves illustrated refer to the 1K2P valve. D.E.Brown

621.396.621 : 621.396.931

1815 DESIGN TRENDS IN MOBILE RADIO REPEATERS. L.G.Sands.
Electronics, Vol. 32, No. 47, 82-4 (Nov. 20, 1959).

Fixed repeaters are used to increase the range of communication between vehicles. Methods of switching on repeaters by means of tone bursts or dial codes generated at the mobile transmitters are described, with circuits. W.G.Stripp

621.396.621 : 621.376.3

1816 F.M. RECEIVER USING NEW DYNAMIC LIMITER. J.G.Spencer.
Wireless Wld, Vol. 65, No. 10, 492-8 (Nov., 1959).

The receiver consists of a grounded-grid preamplifier, oscillator-mixer, two i.f. stages, the dynamic limiter, a double-diode discriminator and the conventional l.f. circuits. The dynamic limiter operates with a 1 V signal, thereby eliminating the need for a third i.f. stage, and consists of a crystal diode in series with a resistor and capacitor in parallel. With a short-period increase in amplitude, the diode-load voltage cannot change but the diode current increases sharply, so increasing the loading. An a.g.c. circuit fed from the diode load corrects slow long-period variations. The limiter is transformer-fed from the second i.f. stage and feeds through a step-up transformer into the discriminator circuit. Details of design are described and test results given. The most important feature is the achievement of an a.m. suppression ratio of 35 dB, which is considered essential for satisfactory operation. H.G.M.Spratt

621.396.621.52

1817 TRANSISTORIZED RECEIVER FOR MARKER BEACON USE. F.P.Smith.
Electronics, Vol. 32, No. 46, 76-8 (Nov. 13, 1959).

Designed for private and small commercial aeroplanes where equipment cost, size and weight are important factors. It uses an autodyne front end, 6.25 Mc/s i.f. and gives audio output as well as coloured light presentation typical of airline-type receivers. The crystal controlled oscillator, automatic volume control and audio filter circuits are briefly described. A circuit diagram is given. J.W.Lee

621.396.621.54

1818 INVESTIGATION OF METHODS OF MAINTAINING A HIGH SCALE GRADUATION ACCURACY BY MEANS OF MECHANICAL CORRECTORS AND A REFERENCE OSCILLATOR. M.E.Movshovich.
Radiotekhnika, Vol. 14, No. 11, 36-42 (Nov., 1959). In Russian.

A mathematical analysis of the conditions for optimal correction of the frequency scales of superheterodyne receivers, using correcting capacitors, inductors or movable scales, as well as combinations of these. Use is made of a theorem of Chebyshev on approximation to a continuous function to derive design formulae for these correcting systems. F.Quelon

RADIOFREQUENCY EQUIPMENT

621.396.66

1819 PRE-RECEIVER ATTENUATOR REDUCES INTER-MODULATION. S.L.Robinette.
Electronics, Vol. 32, No. 45, 64-5 (Nov. 6, 1959).

Intermodulation and cross-modulation interference in a receiver, from strong unwanted signals, can be substantially reduced by attenuation before the receiver. A scheme is described in which the magnetic field of a ferrite device is controlled by the receiver a.v.c. and the first r.f. stages operate on fixed bias. An input transformer on a ferrite core, with one-turn primary and secondary and a control winding, provides variable coupling; control power is 10 W for maximum attenuation. Up to 8 dB improvement in intermodulation rejection was achieved. A coaxial ferrite device, requiring 80 W of control power to produce 46 dB attenuation, is also mentioned. 6 references. A.Reiss

621.396.662 : 621.397.62

1820 THE DESIGN OF EXPERIMENTAL TUNERS FOR BANDS IV AND V. K.H.Smith.
J. Televis. Soc., Vol.9, No.3, 103-114, 123 (July-Sept., 1959).

The performance of double-mixing and single-mixing input circuits is compared and the desirable features for 400-800 Mc/s tuners listed. To achieve low noise and high sensitivity, the provision of an r.f. stage followed by a combined mixer-oscillator appears desirable. The design of such a unit, consisting of a grounded-grid triode amplifier stage and a triode oscillator-mixer, is described in detail. Important features include: (1) the use of trough tuning lines with a 3-gang variable capacitor; (2) greatest possible reduction of grid-lead inductance; and (3) the significance of input impedance measurements in determining the effect of this inductance. Performance figures are given for three different circuits, involving two different types of valve. The reduction of oscillator frequency drift remains a problem. H.G.M.Spratt

AERIALS

621.396.67

1821 CALCULATION OF THE EFFECTIVE AREA OF A SURFACE-TYPE RADIATOR WITH UNEQUIPHASE DISTRIBUTION. G.F.Koch.
Arch. elekt. Ubertragung, Vol. 13, No. 11, 462-6 (Nov., 1959). In German.

The influence of a deviation from equiphase distribution on the effective area of a surface-type radiator as examined theoretically. In the case of an active radiator this deviation is proportional to the square of the ratio of the field strengths generated with equiphase and unequiphase distributions; in the case of a passive reflector the deviation is proportional to this ratio itself. The relationships holding for the active radiator cannot be used for the definition of the effective area of a passive radiator; the general case (uneven surface) can be calculated from the transfer function holding for the deflecting path. Z.F.Voyner

621.396.673

1822 FIELDS IN ELECTRICALLY SHORT GROUND SYSTEMS: AN EXPERIMENTAL STUDY.
A.N.Smith and T.E.Devaney.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 2, 175-80 (Sept.-Oct., 1959).

An experimental study of magnetic field distribution in a simplified radial ground system on poorly conducting soil under an electrically short, toploaded monopole is described. It is shown that the distribution is that expected from the theory of J.R.Wait in those portions of the radial system satisfying the assumptions of the theory, and that the theory may still be successfully applied for H-field power loss computations even when this is not fully the case. The particular model system studied exhibits a condition suggesting damped standing waves on the radials in the area where the radial spacing exceeds that required by the theory.

621.396.676

1823 AN IMPROVED MISSILE AERIAL STABILIZATION SYSTEM. D.Peat.
Brit. Commun. and Electronics, Vol. 6, No. 12, 854-5 (Dec., 1959).

A single large gyroscope is often used as the stabilising element to maintain a directional aerial pointing at a target, irrespective of the movement of the vehicle carrying the aerial. A smaller two-gyroscope system is described which would overcome most of the disadvantages of the single gyroscope system.

621.396.677

1824 THEORETICAL STUDY OF SOME LOZENGE OR RECTANGULAR AERIALS FOR VERTICAL IONOSPHERIC SOUNDING. P.Halley.

Ann. Telecomm., Vol. 14, No. 11-12, 289-96 (Nov.-Dec., 1959). In French.

Zenithal ionospheric sounding requires the use of aerials with high vertical directivity. A conventional analysis is carried out to determine the radiation pattern of two suitable forms — a rhombic whose short diagonal is vertical and a rectangular aerial situated in a vertical plane with its long side horizontal. In the former case, curves of directivity v. ratio of conductor length to wavelength are given for various lozenge angles, while similar curves are included for the latter case for differing ratios of the lengths of short to long side. G.D.Sims

621.396.677

1825 EFFECTIVE RESISTANCE OF DIPOLES OF FINITE LENGTH AND THICKNESS. K.Fritnz and E.Henze.

Arch. elekt. Übertragung, Vol. 13, No. 10, 429-34 (Oct., 1959). In German.

Calculation of the real part of the impedance of a dipole family between the limits $\lambda < 2h < 3\lambda/2$, where 2h is the length of a dipole and λ is the wavelength. The dipole dimensions can be easily evaluated by simple integration and a solution of a first-order differential equation. Z.F.Voyner

621.396.677

1826 CROSSED AERIALS WITH EQUAL LINEAR ELEMENTS. N.Nasu and Y.Mushiake.

J. Inst. Elect. Commun. Engrs Japan, Vol. 42, No. 9, 815-22 (Sept., 1959). In Japanese.

The input impedances of cross-type aerials are calculated, the theoretical results being found in good agreement with experimental results obtained from measurements at 200 Mc/s. Application is made to determine the input impedances of biconical aerials constructed with n equal linear elements, n ranging from 3 to 10. In all cases the results obtained are shown in diagrams. A.Wilkinson

621.396.677

1827 DEVELOPMENT OF HIGHLY DIRECTIVE AERIALS IN RADIO ASTRONOMY. W.N.Christiansen.

Proc. Instn Radio Engrs Australia, Vol. 20, No. 9, 519-26 (Sept., 1959).

The design requirements for aerials to be used in radio astronomy, and the relationship between aerial size and beam-width are discussed. The amount by which an aerial can depart from its designed shape without serious deterioration in performance provides the upper limit in working frequency for most systems. The difficulty of maintaining a given shape increases rapidly with aerial size. An illustrated survey is given of the various types of radio astronomy aerial, and the special merits of each are explained. W.T.Blackband

621.396.677

1828 PATTERN SYNTHESIS — SIMPLIFIED METHODS OF ARRAY DESIGN TO OBTAIN A DESIRED DIRECTIVE PATTERN. G.H.Brown.

R.C.A. Rev., Vol. 20, No. 3, 398-412 (Sept., 1959).

Mathematical methods of determining the magnitude and phase of the current distribution over an extended linear aerial aperture in order to obtain a desired directive radiation pattern are described. It is shown that the radiation pattern and current distribution form a set of Fourier transforms, thus yielding a ready solution to the problem. By adding a pattern in an imaginary zone to the desired real pattern, many current distributions or array configurations are found, all of which give the same desired pattern in the real zone.

621.396.677

1829 ON SOME GENERAL PROPERTIES OF DIRECTIVITY OF AERIALS. E.B.Korenberg.

Radiotekhnika, Vol. 14, No. 9, 13-16 (Sept., 1959). In Russian.

For receiving and transmitting communication aerials in free space there will always be mutual orientations at which communication can take place between them. In the case of a fixed transmitting aerial and the receiving aerial changing its orientation (but not its position in space) there exists an orientation at which the e.m.f. at the output of the receiver aerial is zero. If the orientation of the transmitting aerial is altered without changing its position in space there exists an orientation of the receiving aerial for which the e.m.f. is zero. When two arbitrary receiving and transmitting aerials are placed in free space and the distance between them is sufficiently large in order that one aerial is in the plane-wave region of the other, there is an infinite number of mutual orientations possible for which reception will exist. Z.F.Voyner

621.396.677 : 621:372.826

1830 THE SURFACE-WAVE AERIAL. W.Hersch.

Proc. Instn Elect. Engrs, Monogr. 363E, publ. Feb., 1960, 11 pp. To be republished in Part C.

The radiation from the open-circuited end of an externally dielectric-coated metallic waveguide can be controlled by varying the size of the guide, the thickness and/or the dielectric constant of the coating. A new type of aerial designed around this principle is given the name "surface-wave aerial" and radiation-pattern measurements are used to confirm the theory underlying this type of radiator. According to its mode of operation it belongs to the category of end-fire aerials, which are briefly reviewed to show that surface-wave aerials occupy a place in their own right amongst the many possible arrangements that utilize the end-fire effect to produce a directional radiation pattern. The theory of the surface-wave aerial is developed in detail, a necessary preliminary step being a full theoretical analysis of the properties of the first-order cylindrical surface wave. It is shown that a dielectric-coated cylinder which is approximately a wavelength in circumference can act as a waveguide for higher-order surface waves, of which the first order is an example. The "characteristic equation" is determined for the general case from which the cut-off frequency, propagation coefficient and conditions under which propagation can take place are derived in turn. Two specific cases are evaluated numerically and the results are used to calculate the polar diagrams of surface-wave aerials operating at 9 Gc/s. The wavelength constant as well as the continuous radiation loss of a surface waveguide for which $\lambda_g/\lambda_0 \cong 1$ are measured directly and the results obtained are used to account for the radiation pattern of very long aerials. In conclusion, an outline of future work is given.

621.396.677 : 538.56

1831 ANALYSIS AND SYNTHESIS OF RADIATION PATTERNS FROM CIRCULAR APERTURES.

A.Ishimaru and G.Held.

Canad. J. Phys., Vol. 38, No. 1, 78-99 (Jan., 1960).

Considers the problem of determining the source distribution over a circular aperture required to produce a prescribed radiation pattern. In particular, the problem of optimizing the narrow broadside pattern from a circular aperture is discussed in detail and an improved design method over Taylor's (see Abstr. 3927 of 1955) for line source is devised. Numerical examples are given. The analysis of the radiation pattern from a circular aperture from r_1 to r_2 with the travelling-wave type source functions is then given. Expressions suitable to the analysis and the synthesis are obtained and the narrow-beam and shaped-beam synthesis are discussed.

621.396.677

1832 SURFACE-WAVE AERIAL WITH A TILTING BEAM. K.I.Grintva.

Radiotekhnika, Vol. 14, No. 10, 15-22 (Oct., 1959). In Russian.

The properties of a double surface-wave aerial are examined. The radiation pattern of the aerial is narrower than that of an ordinary aerial having the same dimensions, its direction can be varied by changing the phase of either of the aerial feeds. The amplitude of the beam tilt can be further increased by using tuned elements and by quadrupling the aerial. A double surface-wave aerial can also produce an equisignal region for possible applications in navigation. Z.F.Voyner

621.396.677.32

1833 GUIDED WAVE STRUCTURES FOR END-FIRE ARRAYS. U.v.Trentini.

Nachrichtentech. Z.(N.T.Z.), Vol. 12, No. 10, 501-8 (Oct., 1959). In German.

A general discussion of surface-wave aerials. Particular attention is given to aerials carrying the HE_{11} (dipole) mode and a number of basic types are studied. The problem of improving gain is tackled in a number of ways and for some types an overall gain of the order of 20 dB is claimed. Several design formulae and methods of excitation are analysed particularly with a view to suppression of unwanted side-lobes. A.E.Karbowiak

621.396.677.32 : 538.56

1834 THE RADIATION CHARACTERISTICS OF A SINUATE ANTENNA. S.C.Loh.

Canad. J. Phys., Vol. 38, No. 1, 119-27 (Jan., 1960).

Rigorous expressions for the radiation field of an aerial of sinusoidal shape are derived on the assumption of a travelling-wave type of current distribution along the conductor. In order to illustrate the derived results an endfire aerial is designed and some calculations of radiation field are presented.

621.396.677.45

1835 AN INVESTIGATION OF THE COMPLEX MUTUAL IMPEDANCE BETWEEN SHORT HELICAL ARRAY ELEMENTS. A.R.Stratoti and E.J.Wilkinson.
I.R.E. Trans Antennas and Propagation, Vol. AP-7, No. 3, 279-80 (July, 1959).

Curves are given which record the results of an experimental study of the mutual impedance between helical aerials. The mutual impedance is small compared with that between dipoles; it can be varied by the axial rotation of one helix. The insertion of a resistor $\lambda/4$ from the end of the helices gives a marked decrease in mutual impedance without interfering with the functioning of the aerial.
W.T.Blackband

621.396.677.71

1836 PATTERN SYNTHESIS FOR SLOTTED-CYLINDER ANTENNAS. J.R.Wait and J.Householder.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 3, 303-13 (Nov.-Dec., 1959).

The radiation from a cylinder excited by an array of axial slots is discussed. A procedure for synethesizing a given radiation pattern is developed with particular attention being paid to a Chebyshev-type pattern. Specifying the side-lobe level and the width of the main beam, the required source distributions are computed for a number of cases. The effect of using a finite number of slot elements to approximate the continuous source distribution is also considered.

621.396.677.73

1837 BROADBAND MATCHING OF PARABOLIC HORN REFLECTORS. H.Laub.
Frequenz, Vol. 13, No. 12, 390-7 (Dec., 1959). In German.

Investigation of parabolic horn reflectors for use in microwave radio links; the reflectors are fed by rectangular–square or circular–square transitions and operate with horizontal and vertical polarization. The corresponding theoretical principles are established. The measured bandwidth of a matched rectangular–square transition feeding a reflector was 15% at S-band for a reflection coefficient ≤ 1%. For an assembly comprising a circular–square transition feeding a parabolic horn reflector the reflection coefficient ≤ 1% was measured in the band 3.6 to 11.8 kMc/s, with both horizontal and vertical polarization.
Z.F.Voyner

621.396.677.8

1838 DESIGN FOR THE DIELECTRIC LENS. W.E.Junker.
Electronic Industr., Vol. 18, No. 11, 70-2 (Nov., 1959).

The lens described is a short stepped polyrod to be used with a cylindrical waveguide primary feed. The preliminary design is carried out using cylinders of paraffin wax in place of the polythene or p.t.f.e. of the final model. First the length within the guide is adjusted, and then so is the taper on this internal section. These adjustments control the sidelobe level. The external disks are then adjusted, the one of diameter greater than the waveguide controls both sidelobe and beamwidth, the smaller ones only affect the beamwidth. A 2 : 1 frequency bandwidth can be obtained for a v.s.w.r. > 2 with beamwidth varying only 25% at the 10 dB points and sidelobe level lower than 30 dB down.
W.T.Blackband

621.396.677.833.2

1839 THE DESIGNING OF AN AERIAL OF THE TYPE : PYRAMIDAL HORN-PAROBOLOID OF REVOLUTION. F.Straňák.
Slaboproudy Obzor, Vol.20, No.11, 691-9 (1959). In Czech.

The aerial consists of a pyramidal horn, whose apex is situated in the focus of a paraboloid of revolution, and a segment of the paraboloid. The horn acts as the primary radiator, while the paraboloid forms the reflector. Main design parameters for the aerial are: aperture angle of the horn, θ, and radiation angle of the paraboloid, γ. Formulae for the following geometric parameters of the aerial, as a function of θ and γ, are derived : height, depth, length of the edges of the horn, width, minimum width of the paraboloid segment, minimum width of the aerial mouth, height and area of the fictitious mouth, and limit curves of the paraboloid segment. Parameters are plotted as a function of γ in a number of graphs and formulae are indicated in a table.
R.S.Sidorowicz

621.396.679.4

1840 GANGING TRANSMITTERS TO OVERCOME JAMMING. P.W.Esten.
Electronics, Vol. 32, No. 48, 68-70 (Nov. 27, 1959).

A description is given of the development at the Gloria, Portugal, transmitter station of RARET (Radio Free Europe), of a combining network which enables 4 transmitters on the same wavelength to operate into a common aerial to give increased power. The combiner is of pentagonal form, with the transmitters connected to 4 points such that the electrical distances between any particular input connection and any other input connection are an even number of half-wavelengths by one path and an odd number of half-wavelengths by the other path. This arrangement makes it impossible to feed power from one input connection to another. The output connection to the aerial is located at a point on the network where the power of each transmitter adds to those of the others in phase. A dummy load is also provided to dissipate power during tuning and phase adjustments, the procedure for which is described. The results of tests are given when four 100 kW transmitters with 100% modulation were operated at 15.265 Mc/s.
A.Wilkinson

621.396.679.4

1841 A METHOD OF MATCHING OF AERIAL FEEDS IN MULTICHANNEL RADIO RELAY SYSTEMS. V.I.Krutikov.
Radioteknika, Vol. 14, No. 11, 5-12 (Nov., 1959). In Russian.

Examines the problem of broadband matching of multiplexers and aerial feeds in systems operating over narrow communication channels. This can be done by using directional couplers and separation filters as complex loads. Experimental results for a system consisting of three 20 Mc/s wide channels show reflection coefficients ≥ 2.5% at any frequency for a given system arrangement.
Z.F.Voyner

PROPAGATION . INTERFERENCE

621.391.81

1842 DETERMINATION OF EARTH CONDUCTIVITY FROM THE ATTENUATION OF WAVES IN IT. V.E.Kashprovskii.
Radiotekhnika, Vol. 14, No. 12, 8-14 (Dec., 1959). In Russian.

The method proposed is applicable to the medium- and long-wave broadcast bands, for all but extremely dry soils, and consists essentially in measuring the rate of decrease in field strength with depth below ground surface, utilizing wells or other shafts free from metal. Apparatus required is a relatively simple field-strength meter. Results of some field trials are given and discussed.
F.Quelon

621.391.812

1843 STUDY AT 1046 MEGACYCLES PER SECOND OF THE REFLECTION COEFFICIENT OF IRREGULAR TERRAIN AT GRAZING ANGLES. R.E.McGavin and L.J.Maloney.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 2, 235-48 (Sept. - Oct., 1959).

An experimental determination of the reflection coefficient over rough terrain is reported. The reflected signal received over rough terrain is considered to be made of two components, one that is a specular component and the other a Rayleigh-distributed component. Where one terminal is low, the Rayleigh component is considered to be small with respect to the specular component but increases in relative magnitude as the height of the lower terminal increases. A terminal height is reached where the specular component is no longer significant, and the reflected energy is essentially Rayleigh-distributed. A terminal height is quickly reached above which the mean value of the reflected energy is relatively constant, of a low value, and independent of the grazing angle.

621.391.812

1844 TRANSEQUATORIAL PROPAGATION OF V.H.F. SIGNALS. R.G.Cracknell.
Q.S.T., Vol. 43, No. 12, 11-17 (Dec., 1959).

Results are given of numerous observations, by amateurs, of the reception of v.h.f. signals from stations at great distances on the other side of the geomagnetic equator. In general, the trans-equatorial path is between areas on either side of the geomagnetic equator and 1500 to 2500 miles from it. Transmission is practicable in the hours of darkness and on frequencies up to 1.5 times the observed m.u.f. for F-layer propagation. Optimum propagation conditions occur at the equinoxes, between points having the same longitude and located about 200 miles from the geomagnetic equator. Such transmissions are not limited to the hours of darkness. At the peak of solar activity, daytime signals of frequencies above 50 Mc/s

were weak and infrequent at Salisbury, Southern Rhodesia, but in 1959, signals from the area around the Mediterranean were received at Salisbury very regularly and at good strength on frequencies up to 56 Mc/s throughout the day. The modulation of transequatorial signals is often subject to characteristic flutter fading, so that while the signals may be good enough for communication purposes, this mode of propagation seems unlikely to be of value for broadcasting or television. The general characteristics of this type of signal are described, with diagrams, and seasonal effects are discussed.

A.Wilkinson

621.391.812

1845 RECEPTION OF SPACE DIVERSITY TRANSMITTERS. J.W.Koch.

Wireless Wld, Vol. 65, No. 10, 512-14 (Nov., 1959).

A series of tests is described, made between Daventry and Woofferton, England and Boulder, Colorado, at 9510 kc/s, to test the effectiveness of wide- and close-spaced transmitter diversity over long-distance paths. Little advantage was obtained by using space-diversity, the resultant field was found to be Rayleigh distributed and thus there was no realizable diversity gain. The fading rate did not differ significantly for any method of transmission.

G.D.Sims

621.391.812.3

1846 FADING OF MICROWAVE RELAY LINKS. K.Morita.

J. Inst. Elect. Commun. Engrs Japan, Vol. 42, No. 10, 923-9 (Oct., 1959). In Japanese.

The results of statistical studies of fading and fluctuation of communication quality in microwave relay links are described and discussed. The results indicate that the probability distributions of the fluctuation in received power due to duct-type fading are approximated by gamma distributions (Pearson's type III distribution), and those in thermal noise by inverse gamma distributions (Pearson's type V distribution). For a particular value of its parameter, a gamma distribution coincides with a Rayleigh distribution when a variable of the latter is converted into power. A remarkable increase of thermal and interference noise of a radio relay circuit is caused by the occurrence of Rayleigh fading. In general, little correlation exists between the fadings on any two relay links. In the case of a 2500 km circuit, composed of 50 km links, the mean thermal noise under the worst propagation conditions was found to be about 4 dB > that without fading.

A.Wilkinson

621.391.812.3

1847 CHARACTERISTICS OF MEDIUM-WAVE FADING. E.Sawamura.

J. Inst. Elect. Commun. Engrs Japan, Vol. 42, No. 10, 934-7 (Oct., 1959). In Japanese.

The fading rate and the variation of the median values of the field strengths over the whole year from Nov., 1951, are reported for night-time medium-wave propagation over paths of lengths in the range 315 to 1006 km. Results of measurements of the fading distribution for these paths have previously been reported in the journal. The standard deviation of the variation of the median values of field strength is found to be 4-5 dB, and the fading rate is, as expected, approximately proportional to the probability density of the fading distribution.

A.Wilkinson

621.391.812.3

1848 THE POTENTIAL NOISE STABILITY OF A SIGNAL DURING FADING. L.M.Fink.

Radiotekhnika, Vol. 14, No. 9, 3-12 (Sept., 1959). In Russian.

Optimum criteria for best reception of discrete signals in fluctuation noise are presented. In the case of Rayleigh fading, for certain types of telegraph system the minimum probability of error is calculated as the function of the ratio of the energy of a signal element to the power density of the noise.

S.C.Dunn

621.391.812.3 : 621.317.79

FADING-RATE RECORDER FOR PROPAGATION RESEARCH. See Abstr. 1422

621.391.812.42

1849 THE FREQUENCY DEPENDENCE OF SOLAR-FLARE EFFECTS IN THE LONGEST-WAVE RANGE. H.Volland.

Arch. elekt. Übertragung, Vol. 13, No. 10, 443-8 (Oct., 1959). In German.

Measurements of the field strength of signals from the transmitters GBR (16 kc/s), GBZ (19.6 kc/s) and GIY 20 (51.95 kc/s) at the Heinrich Hertz Institute, Berlin–Charlottenburg, show positive and also negative field-strength anomalies which are dependent on frequency, time of day and season of year. These anomalies are explained as being due to interference effects between the ground wave and the space wave reflected from the ionosphere, it being assumed that the height of the reflecting layer decreases during a solar flare. The mean apparent reflection-layer height for 16 kc/s signals is from 69 to 76 km, according to the time of year. During the existence of a solar flare it may decrease to 12 km. A similar explanation can be given of the change of the frequency spectra of atmospherics during a solar flare.

A.Wilkinson

621.391.812.42

1850 REVIEW OF THE PRESENT STATE OF THE WORK OF THE EUROPEAN BROADCASTING UNION (E.B.U.) ON THE IONOSPHERIC PROPAGATION OF LONG AND MEDIUM WAVES. W.Ebert, H.Ehlers and R.Dobiasch.

Rdfunktech. Mitt., Vol. 3, No. 5, 205-18 (Oct., 1959). In German.

Since October, 1952, extensive series of measurements concerning the ionospheric propagation of long and medium waves have been carried out within the framework of a programme drawn up by the E.B.U., the object being to obtain well founded basic information for establishing a generally recognized night-time propagation curve or family of curves. The present state of this work is here reviewed. The measurement and evaluation methods are briefly described and the degree of accuracy to be expected is indicated. The results so far obtained from the statistical evaluation of the measurements relate to the statistical distribution of the instantaneous field-strengths in the course of a given recording hour, to the annual distribution of the hourly median values of the fieldstrength, as well as to the dependence of the fieldstrength on the sunspot cycle, on the geomagnetic latitude of the midpoint of the transmission path, on the frequency used and on the season of the year. The results presented are mainly based on recordings, each of 1 hour duration, made at fixed recording times (21.00 to 22.00 or 21.30 to 22.30 G.M.T.). Since other recordings have shown that the median fieldstrengths show large variations during the course of the night and that the maximum nocturnal fieldstrength is reached at a later hour than the fixed recording times so far used, longer recordings lasting the whole night, with ½ hour recording periods, have been carried out on an extensive basis since the beginning of 1959. The first results obtained from these all-night recordings are reported. A comparison is made between the E.B.U. provisional curves and some well known curves. The probable further course of the work of the E.B.U. is outlined. For an English translation of this paper, see following abstract. For a French translation, see Revue de l'U.E.R.A., Vol. 57, 2-16 (Oct., 1959).

A.Wilkinson

621.391.812.42

1851 IONOSPHERIC PROPAGATION ON LONG AND MEDIUM WAVES. A REVIEW OF THE WORK OF THE EUROPEAN BROADCASTING UNION. W.Ebert, H.Ehlers and R.Dobiasch.

E.B.U. Rev. A, No. 57, 2-16 (Oct., 1959).

A translation into English of the paper covered by the preceding abstract.

621.391.812.5 : 538.56

1852 GEOPHYSICAL EFFECTS OF HIGH-ALTITUDE NUCLEAR EXPLOSIONS. T.Obayashi, S.C.Coroniti and E.T.Pierce.

Nature (London), Vol.183, 1476-8 (May 23, 1959).

The time of the Aug. 1, 1958, explosion on Johnston Island coincided with a loss of signal on three transmitters (15 Mc/s, Honolulu; 10 Mc/s, Honolulu; 13.75 Mc/s, San Francisco) as received at Hiraiso, Japan, although the path from San Francisco to Japan is ~ 3600 km from Johnston Island (and more remote from the geomagnetic conjugate of Johnston). The explosion of Aug. 12, 1958, coincided with a pronounced effect for the Honolulu transmitter on 15 Mc/s (a less marked effect for the other Honolulu transmitter, and no significant effect for the San Francisco station). Besides, an enhancement of the level of atmospherics on 28 kc/s was detected at the time of explosion. These effects are similar to those caused in the ionosphere by a solar flare.

F.Lachman

621.391.812.5

1853 COSMIC RADIO WAVES. J.Budějický.

Slaboproudy Obzor, Vol. 20, No. 10, 634-42 (1959). In Czech.

Surveys the present state of knowledge of the radio-frequency

radiation of cosmic origin and discusses the methods of its measurement. The main sources of the cosmic radiation are the Galaxy, the nebulae and the interstellar matter (dust); there are also various, comparatively strong local sources (Cygnus A, Taurus A, Virgo A, Centaurus A and Cassiopeia A). The continuous cosmic noise, observed in most areas of the sky is thought to be due to a large number of small local sources which cannot be singled out by present means. The measurement of the radiation is done by means of radio telescopes. The most notable are the telescopes of Jodrell Bank, Harvard University, the Physics Institute of the Soviet Academy of Sciences and the H.Hertz Institute in Berlin; the Cambridge interferometer and the Mills cross-aerial telescope are particularly promising. There are 26 references. R.S.Sidorowicz

621.391.812.5

1854 DESIGN AND RESULTS OF THE OBSERVATION PROGRAMME OF THE IONOSPHERIC RESEARCH AND RADIO-ASTRONOMY DEPARTMENT OF THE NETHERLANDS P.T.T. L.D.de Feiter.
Tijdschr. Ned. Radiogenoot., Vol. 24, No. 4, 189-98 (1959).
In Dutch.

Discusses radio observations of the sun during recent years of max. solar activity. The sun is kept under continuous observation at 200 and 545 Mc/s by radio telescopes at the Nera observatory in Holland and by stations in Dutch Guiana and New Guinea. Type IV solar radio bursts are important in forecasting geomagnetic storms. From interferometry measurements described,diameters of sources of enhanced emission and brightness distributions over the source can be determined. G.N.J.Beck

621.391.812.6

1855 EFFECT OF ATMOSPHERIC HORIZONTAL INHOMOGENEITY UPON RAY TRACING.
B.R.Bean and B.A.Cahoon.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 3, 287-92 (Nov.-Dec., 1959).

The tracing of radio rays is normally carried out under the assumption that the refractive index varies only in the vertical direction. Although this assumption appears to be quite reasonable in the average or climatic sense, it is seldom satisfied under actual conditions and is strongly violated by horizontal airmass changes occurring near frontal and land–sea interfaces. This latter case is investigated by tracing rays through two instances of observed marked horizontal variation of the refractive index. The bending for these ray paths was then compared with values obtained under the normal assumption of horizontal homogeneity. Although at 1 km and above these horizontal changes appear to have little effect, rays emitted at low elevation angles are sensitive to extreme horizontal variations of the atmosphere near the surface, such as those associated with ducting conditions. However, since it appears that such conditions occur less than 15% of the time at most locations, the majority of ray-path calculations may be carried out under the normal assumption of horizontal stratification of the refractive index.

621.391.812.61 : 551.5

1856 VERY -LOW-FREQUENCY RADIATION SPECTRA OF LIGHTNING DISCHARGES. W.L.Taylor and A.G.Jean.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 2, 199-204 (Sept.-Oct., 1959).

Spectral analyses are given of the groundwave portion of 33 sferic waveforms recorded from cloud-to-ground lightning discharges which occurred at distances ranging between about 150 and 600 km from Boulder, Colo. Frequencies of peak energy lie between 5 and 20 kc/s, which agree favorably with other published results. The average value of energy calculated from the groundwave pulses was found to be 26 600 J, which is lower than values dervied from other experiments. Various parameters, such as the peak amplitude and duration of the first half-cycle, are related to the radiated energy of the stroke.

621.391.812.62 : 551.5

1857 RADIO-REFRACTIVE-INDEX CLIMATE NEAR THE GROUND. B.R.Bean and J.D.Horn.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 3, 259-71 (Nov.-Dec., 1959).

The radio refractive index of air is a function of atmospheric pressure, temperature, and humidity and is found to vary in a systematic fashion with climate. It was found that the surface value of the refractive index may be estimated four to five times more accurately from charts of reduced-to-sea-level values than from similar sized charts of surface index. Worldwide maps of 5-year means of this reduced value are presented for the months of February and August, for the minimum monthly mean value of the year and for the range of monthly mean values. Year-to-year variation of monthly means is also considered. Applications of these data to the prediction of radio field strengths indicate a possible 30 dB difference in median level of identically equipped tropospheric communications systems due to climate alone.

621.391.812.621

1858 CENTRAL RADIO PROPAGATION LABORATORY EXPONENTIAL REFERENCE ATMOSPHERE.
B.R.Bean and G.D.Thayer.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 3, 315-17 (Nov.-Dec., 1959).

The background and development of an exponential model of atmospheric radio refractivity, the "C.R.P.L. Exponential Reference Atmosphere" is outlined. A set of ray tracings for the model is presented in the form of tables of refraction variables for the complete range of observed values of surface refractive index. A detailed analysis of the accuracy of the ray tracing and tabulation methods is made for these tables. The variables are presented as numbers between one and ten multiplied by the appropriate power of ten, thus maintaining a maximum number of significant figures. The tables may be used for the solution of practical refraction problems involving elevation angle errors, range errors, and similar quantities.

621.391.812.623

1859 DIFFRACTION THEORY OF TROPOSPHERIC PROPAGATION NEAR AND BEYOND THE RADIO HORIZON. I. THEORY: II. COMPARISON WITH EXPERIMENTS. O.Tukizi.
I.R.E. Trans Antennas and Propagation, Vol. AP-7, No. 3, 261-7, 268-73 (July, 1959).

By means of the earth-flattening approximation, the problem of radio diffraction by the earth is treated as that of refraction in an atmosphere with a linear profile of modified index. Use is made of the saddle point method, whose special case,known as the method of stationary phase, proves useful for analysis of the normal propagation within the horizon. It is found that the classical diffraction theory is as valid at ranges beyond the horizon as in its neighbourhood, if account is taken of the contribution of other terms than the first of the residue series and that exclusive use of the saddle point method makes it possible to deal systematically with the tropospheric propagation for all regions within, near, and beyond the horizon. Theoretical derivations are presented in Part I. Part II gives a comparison of the theory with experiments, showing a fairly good agreement between them.

621.391.812.624

1860 RADIO-WAVE SCATTERING BY TROPOSPHERIC IRREGULARITIES. A.D.Wheelon.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 2, 205-33 (Sept. - Oct., 1959).

Scattering by turbulent irregularities in the tropospheric index of refraction is reviewed. Descriptions of the turbulent medium are considered first, together with a status report on physical theories for the spectrum of irregularities. Phase and amplitude scintillations induced on e.m. waves propagated along line-of-sight paths are discussed next. The complementary problems of signal statistics and electromagnetic-propagation calculations are summarized and compared with available data. Both the geometrical optics and wave–theory approaches are discussed. The theory of propagation beyond the horizon by scattering from the same irregularities is then described. A current review of the predictions for received power, signal fluctuations, and aerial effects is given. The paper is primarily a review of the essential and auxiliary predictions of scatter theory, but also contains a considerable amount of unpublished research by the author. 81 references are given.

621.391.812.624 : 621.396.677

1861 PATH ANTENNA GAIN IN AN EXPONENTIAL ATMOSPHERE. W.J.Hartman and R.E.Wilkerson.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 3, 273-86 (Nov.-Dec., 1959).

The problem of determining path aerial gain is treated here in greater detail than previously (see Abstr. 6362 of 1957). The method used here takes into account for the first time the exponential decrease of the gradient of refractive index with height, and a scattering cross-section inversely proportional to the fifth power of the scattering angle. Results are given for all combinations of beamwidths and path geometry, assuming that symmetrical beams are used on both ends of the path and that atmospheric turbulence is isotropic. The result appears as a function of both of the beamwidths, in addition to other parameters, and thus the loss in gain cannot be determined independently for the transmitting and receiving aerials. The values of the loss in gain are generally lower than the previous estimates for which a comparison is possible.

621.391.812.624

1862 THE FILLING IN OF AN ANTENNA NULL BY OFF-PATH SCATTERING ON A TROPOSPHERIC SCATTER CIRCUIT. H.Staras.
I.R.E. Trans Antennas and Propagation, Vol. AP-7, No. 3, 277-9 (July, 1959).

Data are presented which permit an assessment of the filling in of a null in the radiation pattern of an aerial seen from beyond the horizon. For a sharp null this filling is marked and it is concluded that in order to protect a distant station a null would need to extend at near zero values over a few degrees of azimuth.

W.T.Blackband

621.391.812.63

1863 THE GENERAL METHODS OF THE LINDAU/HARZ STATION FOR THE DETERMINATION OF THE TRUE DISTRIBUTION OF THE ELECTRON DENSITY IN THE IONOSPHERE. W.Becker.
Arch. elekt. Übertragung, Vol. 13, No. 9, 373-82 (Sept., 1959). In German.

Three non-electronic methods are described. Of these, the general method is free from any restrictions. It is based on the fact that with an inclination of 67° or more in the earth's magnetic field, a purely longitudinal propagation can be assumed for the extraordinary component of a sounding wave, so that Rydberg's inversion for purely longitudinal propagation can be applied. The two correction methods, intended for reduction of the ordinary and extraordinary sounding traces, respectively, depend in their accuracy on the degree of agreement between the observed profile of the layer considered and the profile of a reference layer previously determined. The two methods determine the corrections to be applied to this reference profile in order to obtain the true profile of the layer investigated. In their practical realization, all the three methods make use of the slide-rule principle. A 10-point N(h) analysis by the general method takes about 2 hours and by each of the correction methods about 1.5 hours. The accuracy of the results obtained by all the three methods is > the practical measurement accuracy. The advantage of the methods over present electronic methods is that besides having the reliability of the author's comparison method (see Abstr. 5564 of 1959), they also take into account an extrapolation of the sounding traces down to the abscissae origins $f = 0$ and $f = f_H$ respectively.

A.Wilkinson

621.391.812.63

1864 INTERPRETATION OF THE VARIATION OF IONOSPHERIC ABSORPTION AS A FUNCTION OF FREQUENCY. K.Bibl, A.Paul and K.Rawer.
C.R. Acad. Sci. (Paris), Vol. 248, No. 7, 949-52 (Feb. 16, 1959). In French.

Noon ionospheric absorption measurements on eight frequencies at Fribourg have been compared with various expressions for the variation with frequency, and it is found that when there are appreciable departures from a relation given by the authors, an Es layer was usually present. The relation takes account of both non-deviative (D region) and deviative (E region) absorption. Results for summer 1958 indicate that deviative absorption increases with solar altitude, while non-deviative absorption decreases. The former change corresponds approximately with the decrease of h'E.

G.M.Brown

621.391.812.63 : 551.5

1865 STRATIFICATION IN THE LOWER IONOSPHERE. C.Ellyett and J.M.Watts.
J. Res. Nat. Bur. Stand., Vol. 63 D, No. 2, 117-34 (Sept.-Oct., 1959).

A survey of the evidence for stratification in the ionosphere below 100 km is given, covering radio and optical observations, and rocket measurements. The conclusion is reached that one stratum at about 85 km is observed consistently, and that other fine structure exists but has no long-time constancy of height or pattern. There is no series of preferred heights below 100 km. Explanations are considered which may account for the observations, and the testing of radio methods of exploration in conjunction with rocket measurements is advocated in order to develop the most practicable means of obtaining accurate electron density v. height profiles on a synoptic basis. A bibliography of approximately 150 references is given.

621.391.812.63 : 551.5

1866 EFFECT OF SMALL IRREGULARITIES ON THE CONSTITUTIVE RELATIONS FOR THE IONOSPHERE. K.G.Budden.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 2, 135-49 (Sept.-Oct., 1959).

Irregularities in the ionosphere which are small compared with one wavelength may modify the constitutive relations, and hence, may affect the refractive indices for electromagnetic waves. The modifications are in some ways similar to those which would be introduced into the Appleton–Hartree formula by a Lorentz force. The theory is given first for the case when the irregularities extend only in one dimension, and it is found that even in a loss-free medium the refractive index now has an imaginary part which might be associated with loss of energy from the wave by scattering. The theory for three-dimensional irregularities is then discussed but is more difficult, and a method of successive approximations is used. The results indicate that small irregularities may play an important part in the propagation of very-low-frequency radio waves in the ionosphere. In particular, they may explain why "whistlers" are observed only on comparatively rare occasions.

621.391.812.63 : 551.5

1867 IONOSPHERIC INVESTIGATIONS USING THE SWEEP-FREQUENCY PULSE TECHNIQUE AT OBLIQUE INCIDENCE. V.Agy and K.Davies.
J. Res. Nat. Bur. Stand., Vol. 63D, No. 2, 151-74 (Sept.-Oct., 1959).

Describes the present state of oblique-incidence investigations of the ionosphere, using the sweep-frequency pulse technique, with special reference to the work carried out at the National Bureau of Standards. After a short review of the published literature, oblique-incidence sweeps are presented showing the diurnal and seasonal variations on two east–west paths of lengths 1150 km and 2370 km. The discrepancies between observed and calculated m.u.f's. are presented for both paths and then various phenomena of interest are shown. Finally, the above phenomena are discussed in the light of existing knowledge and theory and, in particular, it is shown that the discrepancies between observed and calculated m.u.f's. are unlikely to be caused by magneto-ionic deviation of the ray.

621.391.814

1868 DISTRIBUTION OF RECEIVED POWER IN OVERSEA PROPAGATION WITHIN LINE-OF-SIGHT. K.Morita.
J. Inst. Elect. Commun. Engrs Japan, Vol. 42, No. 10, 929-34 (Oct., 1959). In Japanese.

The distribution of received power under conditions of duct-type fading within line-of-sight is known to be generally approximated by the I_0 distribution, defined as a combination of a stationary wave and many random waves. In oversea propagation, the stationary wave reflected from the sea surface must also be taken into account. An approximate formula is derived for the probability density distribution function of received power in a line-of-sight oversea propagation path. This formula applies to the combination of two stationary waves and many irregular random components. Calculations from the formula are found to be in good agreement with experimental results.

A.Wilkinson

621.391.822 : 551.5

1869 NOISE TRAINS. N.C.Gerson and W.H.Gossard.
Canad. J. Phys., Vol. 37, No. 9, 1061-2 (Sept., 1959).

Some preliminary results of a new kind of noise burst, styled a "sweeper", which exhibits a frequency sweep through the 500 kc/s bandwidth of an atmospheric noise spectrograph covering the frequency range 1-30 Mc/s. The drift is usually from high to low frequencies, and may occur in less than 0.1 sec. Possible origins are discussed.

G.M.Brown

621.391.827.42

1870 FINDING RADIO-FREQUENCY INTERFERENCE LEVELS. J.G.Arnold.
Electronics, Vol. 32, No. 48, 71-3 (Nov. 27, 1959).

Simple methods for accurate estimation of the intermodulation products when two near-by transmitters are operated on similar frequencies are described.

A.H.W.Beck

RADIO APPLICATIONS . RADAR

621.396.931 : 621.395

THE SOUTH-LANCASHIRE RADIOPHONE SERVICE. I. THE GENERAL SYSTEM. See Abstr. 1744

621.396.933.1

1871 LONG-DISTANCE RADIONAVIGATION AND TELECONTROL. E.Vassy.

Ann. Telecomm., Vol. 14, No. 9-10, 256-60 (Sept-Oct., 1959). In French.

The RANA navigation system depends upon the phase relationships of signals received at one point from two fixed transmitters. The phase of the signal is determined by the phases and amplitudes of the direct and ionospheric rays. The system involves the transmission of four frequencies from each transmitter. On theoretical grounds a choice of frequencies is made. Relevant experimental evidence is surveyed. W.T.Blackband

621.396.933.25

1872 RADIO BEACON HELPS LOCATE AIRCRAFT CRASHES. D.M.Makow.

Electronics, Vol. 33, No. 4, 54-6 (Jan. 22, 1960).

For abstract, see Abstr. 4372 of 1959.

621.396.933.4

1873 "AUTOLAND": A BLIND LANDING SYSTEM FOR AIRCRAFT.

Electronic Engng, Vol. 31, 534-5 (Sept., 1959).

With this system, an aircraft is landed entirely automatically under a wide variety of weather conditions with much less scatter of the touchdown point than when the aircraft is landed manually in good visibility. The system employs a modified civil autopilot and a coupling unit which computes the desired manœuvre from guidance signals from magnetic leader cable close to the runway, for azimuth, and a radio altimeter for height. General details of the airborne and ground equipment with a description of the landing sequence are given. J.T.Hayden

621.396.933.4

1874 A NEW SIMPLIFIED AIRCRAFT DATA LINK. M.Cooper.

I.R.E. Trans Commun. Syst., Vol. CS-7, No. 2, 133-6 (June, 1959).

The system described is designed for small private aircraft. Signals are decoded by means of a ring counter, each stage of which has signal and enabling imputs. The decoder is easily changed to a responding coder, and can also be arranged for functional operation. The detectors are designed for frequency-shift-keyed transmissions. The features are embodied in a data link which can transmit one of 19 discrete messages, which are compatible with the AGACS traffic control system. W.G.Stripp

621.396.946

1875 ON THE RADIATION FROM ARTIFICIAL EARTH SATELLITES. P.Miram and E.Palm.

Frequenz, Vol. 13, No. 11, 360-5 (Nov., 1959). In German.

Using classical methods, the field strength at a distance r from a crossed dipole array is calculated. When a curved earth and space damping are taken into account, the value obtained for r = 2000 km at 20 Mc/s is so small (0.000063 μV/m) that reception would be impossible. The satellite paths are studied and some values of electron density are given for various levels. Making approximate corrections to the effective distance and the damping function, values of field strength of the order of 1 μV/m are obtained. The d.f. equipment used in tracking is briefly described. W.G.Stripp

621.396.946 : 621.391.812.63 : 551.5

1876 A METHOD FOR MEASURING LOCAL ELECTRON DENSITY FROM AN ARTIFICIAL SATELLITE. L.R.O.Storey.

J. Res. Nat. Bur. Stand., Vol. 63D, No. 3, 325-40 (Nov.-Dec., 1959).

A method is proposed for measuring the electron density at known points in the outer ionosphere, by the use of v.l.f. receiving equipment in an artificial satellite, in conjunction with a v.l.f. transmitter on the ground. The transmitter would radiate continuous waves, which would be propagated through the ionosphere in the "whistler" mode. The basis of the method is a measurement of the local wave-admittance of the medium, by comparison of the signals received on an electric dipole and on a loop. A further proposal is made for an integrated v.l.f. satellite experiment, in which several different types of observation would be made simultaneously.

621.396.946

1877 THE BASIC PROBLEMS OF COMMUNICATIONS IN SPACE. P.Beckmann.

Slaboproudy Obzor, Vol. 20, No. 10, 630-3 (1959). In Czech.

The problems of communication between the earth and a planet (of the solar system) are analysed. It is concluded that the terrestrial transmitter should be situated at one of the Poles. An automatically tracking mirror-type aerial having a diameter of a few tens of metres should be employed. This should transmit circularly polarized waves having lengths from 2 cm to 2 m. The power required for communication with various planets ranges from about 3.5 kW to 75 MW. The waves used in the communications are subject to aberration due to a rapid motion of both terminals of the communication link; the Doppler effect is therefore quite pronounced. Transit times involved have an appreciable effect on the capacity C of a communication channel. C is strongly dependent on the transmission time T. When T is very long, C becomes identical with the capacity of a "terrestrial" channel. R.S.Sidorowicz

621.396.946 : 681.142

THIRTY-TWO AIRCRAFT RADAR TRACK SIMULATOR. See Abstr. 1113

621.396.96 : 538.56

1878 THE RADAR CROSS SECTION OF A SEMI-INFINITE BODY. H.Bryak.

Canad. J. Phys., Vol. 38, No. 1, 48-56 (Jan., 1960).

The concept of cross-section as applied to a semi-infinite scattering body seems to require some clarification. The need for careful formulation of the problem arises because of the simultaneous occurrence of two characteristic lengths tending to infinity: the range from the radar to the target, and the size of the target. The infinite range assumption in the definition of the cross-section allows the incident wave to be approximated as a plane wave in the case of a finite scatterer. For a semi-infinite body, it is customary to retain the plane-wave incidence, and introduce ad hoc arguments to dispose of the awkwardness due to the infinite extent of the scatterer. A return to the basic definition of a cross-section, and examination of its motivation, lead here to an unequivocal formulation for the cross-section of a semi-infinite body. Its consequences are pursued in the physical optics approximation. In particular, the nose-on backscattering from a body of revolution is exhibited, and results are computed for the paraboloid and the cone (which turn out to agree with the traditional ones). The broadside backscattering from a cylinder is also calculated, and the difference in this case between monostatic backscattering and the return in the backward direction from an incident plane wave is discussed.

621.396.96

1879 DIURNAL LAPSE OF SIGNALS FROM SPUTNIK III. G.H.Munro.

Nature (London), Vol. 183, 1549 (May 30, 1959).

The radio signals from the satellite 1958 δ2 have recently ceased to be modulated whilst the satellite is in the earth's shadow, but the modulation is present when the satellite is in sunlight. H.J.A.Chivers

621.396.963

1880 RADAR ECHOING AREA POLAR DIAGRAM OF BIRDS. J.Edwards and E.W.Houghton.

Nature (London) Vol. 184, 1059 (Oct. 3, 1959).

The echoing areas of various birds were determined by the use of a high-resolution X-band radar system and compared with standard metal spheres. The effects of wings, feathers, etc. as well as the orientation of the birds could be measured. C.A.Hogarth

621.396.963.3

1881 BRIGHT RADAR DISPLAYS THROUGH THE USE OF STORAGE TUBES. L.W.Whitaker.

Brit. Commun. and Electronics, Vol. 6, No. 11, 758-63 (Nov., 1959).

Deals with the uses of the direct-view and scan-conversion type storage tubes for increasing the brightness of radar displays.

621.396.967 : 621.395.6

THE SUBJECTIVE EFFECT OF LIMITING THE UPPER AUDIO-FREQUENCY RANGE. See Abstr. 1781

621.396.969

1882 EXPERIMENTAL DETERMINATION OF THE RADAR CROSS-SECTION OF CYLINDRICAL METAL BODIES. E.Meyer, H.Kuttruff and H.Severin.

Z. angew. Phys., Vol. 11, No. 1, 1-6 (Jan., 1959). In German.

The measurements were carried out at 3.2 cm on cylinders suspended by perlon threads, with their axis parallel or perpendicular to the polarization plane, and slowly lifted by a motor at the top of the large reflection-free-room, available in Göttengen, to change the angle of incidence. The incident energy was measured by reflection from objects with known scattering cross-sections. Many results are presented in the form of polar diagrams. H.Motz

621.396.969.182.3

1883 LONG-DISTANCE TRANSMISSION OF ANGULAR VALUES OF A UNIFORMLY ROTATING WAVE. [BEARING TRANSMISSION OF RADAR AERIALS]. K.Dinter.
Nachrichtentech. Z. (N.T.Z.), Vol. 12, No. 10, 491-6 (Oct., 1959). In German.

Information theory is used to determine minimum bandwidth requirements when only departures from the mean are transmitted. Measured results of such variations are reported. Mean value cannot be ignored in practice: a satisfactory method, needing only a small bandwidth extension, is the transmission of an angle reference pulse once per revolution. A practical installation is described. 7 references. A.Reiss.

621.396.97

1884 THE TECHNICAL PROBLEMS OF BROADCASTING. I. SHARING THE ETHER. E.L.E.Pawley.
Engineering, Vol. 189, 22-3 (Jan. 1, 1960).

The first of a series of 5 papers. The various frequency bands at present utilized by the B.B.C. for television and for sound broadcasting are reviewed and interference difficulties are discussed. Coverage of B.B.C. television in the United Kingdom has now reached 98.2% of the population, while that of the v.h.f. sound broadcasting stations extends to 96.4%. To meet the pressing demand, particularly for television, in the areas still unserved, a number of low-power unattended satellite stations are to be built in various parts of the United Kingdom during the next 2 or 3 years, to serve small areas and even individual towns, 14 stations for television and 10 for v.h.f. sound broadcasting being intended. These stations will be of the "translator" type developed by the B.B.C., receiving signals from a high-power station on one channel and transmitting them on another channel without actually producing a video or audio signal at any intermediate stage. Such "translators" are simpler, more stable and more reliable than conventional stations and hence more suitable for unattended operation. A map shows the coverage of the main television stations and the frequency bands used by them, also the approximate location of the proposed satellite stations. Possible utilization of frequencies in Bands IV and V is briefly discussed. A.Wilkinson

621.396.97

1885 LIMITATIONS OF SIMULATED STEREOPHONY WITH PILOT FREQUENCIES AT SUB-THRESHOLD LEVEL. F.Enkel.
Elektron Rdsch., Vol. 13, No. 10, 362-4 (Oct., 1959). In German.

Intensity stereophony, as proposed by Lauridsen, can be transmitted over a single channel in the following manner. Control or "coding" signals corresponding to the instantaneous dynamic range and frequency range of each microphone channel are used to modulate four pilot sub-carriers at 10.2, 10.4, 10.6 and 10.8 kc/s. The two microphone channels are combined to form one channel with a cut-off at 10 kc/s which, with the four pilot channels set below noise level, is applied to the main carrier. At the receiver, the coding signals are extracted and used to control the characteristics of the two channel amplifiers. Frequency discrimination is effective only when there actually is an appreciable difference in the spectra of the two channels: intensity discrimination is limited by the dynamic range of the coding circuits, about 25 dB. The application of the system is confined to the u.h.f. range. H.G.M.Spratt

TELEVISION

621.397 : 77 : 612.8

1886 EXPERIMENTS IN COLOR VISION. E.H.Land.
Sci. Amer., Vol. 200, No. 5, 84-99 (May, 1959).

A description of Land's experiments [See also Abstr. 3372A of 1960; Proc. Nat. Acad. Sci. U.S.A., Vol. 45, No. 1, 115-29 (Jan.); No. 4, 636-44 (April, 1959)] which showed that if the two transparencies, obtained by photographing a scene first through one filter then through another different filter, are projected in register by beams of the colour corresponding to the respective filters, then the eye interprets the field of view as being in the same full colour as the original (although colour saturation is determined by the spectral closeness of the beams). Details of further experiments using such transparencies with pairs of monochromatic beams or with a white light and a monochromatic beam are given, yielding a "colour map" predicting the limitations in faithfulness of colour experienced by the eye. It is further shown (and colour photographs are included) that with white light as one of the sources, normal colour photography of the projected scene is possible. The importance of the work to colour photography and colour television technology is apparent. (See Abstr. 3375A of 1960; I.B.M. J. Res. Developm., Vol. 3, No. 4, 313-25 (Oct., 1959).

621.397

1887 TELEVISION DEVELOPMENT (IN NORWAY). T.Navelsaker.
Tekn. Ukeblad, Vol. 106, No. 48, 1103-10 (Dec. 24, 1959). In Norwegian.

A brief review from (a) the internal aspect, covering studios and work on the new Oslo television house, and (b) the external aspect, transmitters and programme lines. Future expansion indicates a need for revising the 1957 development plane. The coastal programme link between Oslo and Trondheim assumes first priority, and coordination with work on f.m. transmitters is necessary. The revised plan is claimed to be economically feasible, as the number of installed receivers is increasing steadily. G.N.J.Beck

621.397.13 : 621.391.832.2

1888 WAVEFORM DISTORTION IN TELEVISION LINKS. I. INTRODUCTION TO WAVEFORM DISTORTION. II. THE MEASUREMENT AND CORRECTION OF WAVEFORM DISTORTION. I.F.Macdiarmid.
Post Off. elect. Engrs' J., Vol. 52, Pt 2, 108-14 (July): Pt 3, 188-95 (Oct., 1959).

A simple non-mathematical introduction is given to the basic ideas connected with the measurement of waveform distortion. In Part 1, the reasons for the use of waveforms and the choice of test signals are discussed. A number of examples of simple waveform distortions are then given to illustrate the advantages of waveform measurements and their connection with the more familiar steady-state responses. In Part 2, the application of tolerance limits to waveform responses is considered and methods of correction of waveform distortion are described.

621.397.13

1889 PROSPECTS FOR TRANSATLANTIC TELEVISION BY CABLE. R.J.Halsey and A.R.A.Rendall.
Post Off. elect. Engrs' J., Vol. 52, Pt 2, 136-9 (July, 1959).

The possibilities are considered of transmitting television signals across the Atlantic by existing and future submerged-repeater coaxial-cable systems. It is concluded that, by eliminating redundancies in television signals and thus reducing the bandwidth required to, perhaps, 0.5-1 Mc/s, it should be possible to build a suitable coaxial-cable system within a few years. It is unlikely that a more conventional system of the standard used on land could be provided for some seven or eight years, by which time a system using transistors might be fully developed. On existing cables, it should be possible to transmit short television news items on a delay basis by exchanging bandwidth for time, a recorded item being transmitted at a lower speed, re-recorded at the distant end and finally reproduced at normal speed.

621.397.132

1890 COLOUR SUBCARRIER ATTENUATION IN THE N.T.S.C. COLOUR TELEVISION SYSTEM. H.Schönfelder.
Arch. elekt. Übertragung, Vol. 13, No. 9, 383-92 (Sept., 1959). In German.

For the compatible N.T.S.C. system, luminance and chrominance signals share part of the same frequency band and some deleterious secondary effects are unavoidable: the main effects are the so-called "string of pearls" disturbance and the desaturation of some hues due to unwanted rectification at the grids of the c.r.t. Hence the use of a selective wavetrap (notch-filter), tuned to the chrominance subcarrier frequency. The paper deals with design problems of such a filter in a thorough way, describing various wave

trap circuits and their performance in terms of attenuation, bandwidth and transient response; illustrations include diagrams, oscillograms of colour bar waveforms and frequency response curves. A recommended practicable filter has an attenuation of 85%, a bandwidth of 550 kc/s and an overscoring of 3%. A.Landman

621.397.132

1891 N.T.S.C. COLOUR-TELEVISION SIGNALS. EVALUATION OF MEASUREMENTS. J.Davidse.
Electronic Radio Engr, Vol. 36, No. 11, 416-19 (Nov., 1959).
For previous part, see Abstr. 506 (1960).

621.397.132

1892 COLOUR DISTORTION OF LARGE PICTURE AREAS IN THE COLOUR TELEVISION SYSTEM WITH QUADRATURE MODULATION. M.Ptáček.
Slaboproudy Obzor, Vol. 20, No. 11, 676-82 (1959). In Czech.

Quadrature modulation by means of balanced modulators is employed in colour television to produce a colour-carrying signal with a single carrier wave. Nonlinearity of the modulation process leads to colour distortion of "large picture areas". These are defined as coloured areas reproduced by the three signals in the steady-state. The problem of distortion is analysed in some detail and it is found that the region of purple hues is the most critical (as regards the distortion). A number of graphs is given which show distortion as a function of nonlinearity factor k. It is also shown that distortion can be reduced by limiting the amplitudes of the carrier-carrying components. A graph giving maximum permissible amplitudes is given. R.S.Sidorowicz

621.397.132

1893 THE COMPATIBILITY PROBLEM IN MODIFIED N.T.S.C. COLOUR TELEVISION SYSTEMS WITH DIFFERING CHROMINANCE BANDWIDTHS. K.Bernath.
Tech. Mitt. P.T.T., Vol. 37, No. 11. 496-503 (1959). In German.

The problems which are considered deal with reversible compatibility of colour television programme exchanges between C.C.I.R. and O.I.R. transmitters with 7 Mc/s and 8 Mc/s bandwidth respectively; while both systems agree on a chrominance subcarrier frequency of 4.4296875 Mc/s, in the C.C.I.R. transmission I and Q channels are 1.5 Mc/s single-sideband and 0.5 Mc/s double sideband, whereas in the O.I.R. transmission both are 1.5 Mc/s double s.b. The theoretical investigation considers the transient response of a unit function of the I-signal, of the Q signal (C.C.I.R.), of the crossmod. from Q to I channel in the case of a translation from the 8 to the 7 Mc/s system, and of the luminance signal reproduction. The colour triangle diagram is used to plot the above transient responses, three particular typical cases being selected: reversible transmission along green–magenta, blue–yellow and red–green lines. Analytical methods are indicated for the assessment of generated unwanted components; this is illustrated by the construction of vector diagrams, both for the symmetrical and single-band signals. Finally, it is shown that compared with the chrominance transmission problems, the different transmission characteristics of the luminance signal are of secondary importance. A.Landman

621.397.232.2

1894 PRECISION OFFSET OF TELEVISION TRANSMITTERS WITH VARYING FIELD FREQUENCY. R.Busi.
E.B.U. Rev. A, No. 56, 2-5 (Aug., 1959).

If the carriers of two television transmitters are separated by one- or two-thirds of the line repetition frequency and if the separation is an integral multiple of the field (or "mains") frequency, then precision offset exists between the transmitters. If one transmission interferes with the other then it is shown that precision offset, in effect, reduces the power of the interfering transmitter by about 10 dB. Precision offset is relatively easy to obtain when the field frequency is constant. Equipment is described which maintains precision offset under conditions of varying field frequency. Tests show that carriers of the order of 175 Mc/s can be held within ±2 c/s of the precision offset value for variations of ±1 c/s in the field frequency. H.L.Nattrass

621.397.331.2

1895 PRODUCTION OF FINE PATTERNS BY EVAPORATION. S.Gray and P.K.Weimer.
R.C.A.Rev., Vol. 20, No. 3, 413-25 (Sept., 1959).

In producing fine complicated patterns of conductors and insulators by evaporation through masks in vacuum, scattering of material from the masks and migration in the formed films can interfere with desired electrical, optical, and mechanical properties. Methods of measurement of scattering are presented. Scattering itself may be reduced by adjusting the properties of the mask and evaporation conditions. The effects of scattering can be reduced by treatment of the workpiece, as by heat treatment of a conducting pattern. Migration of silver can break down electrical insulation. Diffusion of aluminium into cryolite has been used to produce reverse patterns. Many of these techniques have been applied to the construction of an experimental target for a tricolour pickup tube, which includes an array of interference filter strips registered with which are strips of semitransparent gold electrically connected in three groups. The width of the filter strips is 0.0007 in. Each gold strip is 0.0005 in. wide and is insulated from its two neighbours across a gap of 0.0002 in.

621.397.331.2

1896 BLACK LEVEL INFORMATION AND AVERAGE TELEVISION SIGNAL LEVEL.
S.B.Gurevich and R.E.Bykov.
Radiotekhnika, Vol. 14, No. 9, 57-62 (Sept., 1959). In Russian.

This is a survey, based on well known investigations by Theile, McGee and others, and containing a lengthy criticism of a paper by D.A.Novik (Abstr. 581 of 1959). Relationships between average scene brightness, average television signal and transmitted black level are explained and discussed, including fundamental differences between Orthicon and Vidicon pick-up tubes, in which the retrace scan process reproduces true black level, and Iconoscope devices, where a difference between black and average level depends on ambient light and image content and the gamma of the tube. A.Landman

621.397.331.21

1897 EFFECT OF SCANNING FIELD ON SUPERICONOSCOPE SIGNALS. L.I.Khromov.
Radiotekhnika, Vol. 14, No. 11, 28-35 (Nov., 1959). In Russian.

Based on well-known work by Knoll, Kazan, Theile and Townsend, a general survey of the optimal operational conditions of supericonoscopes is presented. After a brief but concise analysis of the basic principles of operation, explaining the relationships between video signal current, instantaneous value of scanning beam, potential barrier (secondary emission) and average conductivity of a target element, methods of measurement are described, proceeding in 3 steps: (1) with controlled photocathode illumination, a test signal image is recorded for 40 ms at controlled collector potential without a scanning (reading) beam; (2) with the writing process completed, a constant pre-determined voltage is applied to the collector, and the reading scan memorizes the potential barrier, the signal amplitude being measured during the first few scanning lines; (3) an auxiliary process consisting in bringing the target to zero collector potential by exposing it to a uniform high velocity electron beam is carried out. The results of such measurements are discussed in detail and some practical recommendations as to optimal scanning (reading) potential and signal–noise improvement are given. A.Landman

621.397.331.24

1898 THE SYNTHESIS OF BLACK AND WHITE TELEVISION IMAGES FROM COLOURED PICTURE TUBE PHOSPHORS. C.H.Laurence.
Proc. Instn Radio Engrs Australia, Vol. 20, No. 8, 463-71 (Aug., 1959).

The C.I.E. colorimetric system is explained with reference to the mixture of yellow and blue phosphors on cathode-ray tube screens to produce a subjective white luminescence (~7000–11 000° K). The effects of phosphor body colour and of current density, also some details of manufacture and colour control, are briefly discussed. S.T.Henderson

621.397.331.3

1899 AN ENGINEERING APPROACH TO TELEVISION FILM. I. STANDARDIZED GRAY-SCALE VIDICON. L.J.Murch. II. TELEFILM DENSITY AND EXPOSURE CONTROL. H.Wright. III. CONSTANT DENSITY LABORATORY PROCESSES FOR TELEVISION FILM. R.J.Ross.
J. Soc. Motion Picture Televis. Engrs, Vol. 68, No. 11, 739, 740-43, 744-56, 756-63 (Nov., 1959).

621.397.335.1

1900 CALCULATION OF THE FINAL STAGE OF THE FRAME SCANNING GENERATOR. A.A.Zakharov.
Radiotekhnika, Vol.14, No.11, 43-51 (Nov., 1959). In Russian.

Operation of an output stage of the frame scanning circuit is analysed for a scheme with a choke and with a transformer. It is shown how to choose a valve and its operating conditions in order to obtain good linearity of deflecting current. A.Woroncow

621.397.61

1901 A PLAN FOR TELEVISION CHANNEL CONVERTORS [TRANSLATORS]. I.L.Nielsen.

Ingeniøren B, Vol. 68, No. 23, 685-9 (Dec. 1, 1959). In Danish.

To fill gaps in the television coverage of Denmark, the use of channel convertors is proposed. The channel convertor consists of a receiver stage, mixer stage and amplifier stage with corresponding receiving and transmitting aerials. Both the received picture and sound signal from the nearest television station are amplified in the receiver stage and thereafter transferred via the mixer stage to another channel, finally to be amplified to a suitable transmission level. The conditions which a town should fulfil to qualify for a channel convertor are that it should have >7500 inhabitants, and $\frac{3}{4}$ or more of the town should have field strengths <2.5 mV/m for band III or <1 mV/m for band I. 19 towns were investigated and the channel convertor was found to meet technical requirements in all but two cases. G.N.J.Beck

621.397.61

1902 NEW MEASUREMENTS TO DETERMINE THE TRANSMISSION CHARACTERISTICS OF OBJECTIVES IN TELEVISION SYSTEMS. D.Frenzel.

Rdfunktech. Mitt., Vol.3, No.5, 235-41 (Oct., 1959). In German.

After discussing briefly the far from negligible contribution to resolution losses due to optical objectives, a general theoretical analysis of finite aperture scan (unit step response through a low-pass filter) and a novel experimental technique are described, the latter enabling a quick assessment to be made of the overall effect of given objectives on the quality of television transmission. The effect can be expressed in terms of a single resolution frequency with reasonable accuracy. The experimental method consists, in principle, in viewing through the objective —via a narrow scanning slit — moving test bars, achieved by rotation of an illuminated polygon carrying test strips of varying width. The output light current is converted into pulses by a photomultiplier and displayed on an oscilloscope. An extensive bibliography is quoted.

A.Landman

621.397.611

1903 THE FUNCTIONING AND UTILISATION OF SPECIAL-EFFECTS EQUIPMENT IN TELEVISION. G.Stump.

E.B.U. Rev. A, No. 56, 6-10 (Aug., 1959).

Describes the German television-service techniques for providing fading, mixing and inlay effects. The control panels and cubicle are outlined briefly. The circuits producing wipe-fades with vertical, horizontal and oblique boundaries are described in greater detail. They consist of vertical-wipe and horizontal-wipe signal generators which feed through pulse-mixing and limiting stages to control the transition, line by line, from one vision channel to the other. Inlays of non-linear shape, e.g. circular openings, are produced by controlling the two vision channels from a third channel which views a silhouette of the required shape. H.G.M.Spratt

621.397.611

1904 OPTIMIZATION OF THE APERTURE CORRECTIVE SYSTEMS. J.Otterman.

I.R.E. Trans Instrumentation, Vol. I-8, No. 2, 55-62 (Sept., 1959).

See also Abstr.7640 of 1959. The systematic distortions in an aperture system without a corrective network, and with a corrective network, are compared. Optimization of aperture size is discussed under different conditions of noise and signal and under different optimization criteria; i.e., criteria for minimization of both the random and the systematic errors. It is shown that the optimization generally will result in aperture length ranging from $0.75\ \pi/\omega_s$ where ω_s is the limiting frequency of the signal.

621.397.611

1905 LOCAL TELEVISION TRANSMITTER, TESLA 12XJ030. S.Bartůk.

Slaboproudy Obzor, Vol.20, No.11, 687-91 (1959). In Czech.

A general description of the equipment is given (with some block schematics, circuit diagrams and photographs). The transmitter was designed as a test picture generator for a television receiver factory. The system comprises 10 separate channels, each of which contains a picture transmitter consisting of oscillator, frequency-multiplier, single-sideband amplifier and output amplifier. The system comprises also a frequency-modulated sound transmitter which is coupled to each vision transmitter through a buffer-separator stage. The carrier stability of the transmitter is 10^{-4}, its bandwidth is 5.5 Mc/s and output impedance is 70Ω. The output signal can be varied from 5 mV to 0.5 V and the minimum modulation depth is 85%. Vision modulation is negative and the modulation signal is provided with synchronizing pulses having an amplitude of 1.5 V. The transmitter is compared with similar German-built equipment. R.S.Sidorowicz

621.397.62 : 621.396.662

THE DESIGN OF EXPERIMENTAL TUNERS FOR BANDS IV AND V. See Abstr. 1820

621.397.621

1906 COMPARISON OF TRANSIENT RESPONSES OF ELECTRONIC CIRCUITS AND PICTURE TUBE IN COLOUR TELEVISION. P.Neidhardt.

Elektron. Rdsch., Vol. 13, No. 11, 399-403 (Nov., 1959). In German.

A brief survey paper, based mainly on the well-known work by Schade on the quality of colour television images. The need for careful transient-response matching of the various circuit channels and of the three optical systems within the colour tube is explained and discussed. The tube itself is considered as a cascade arrangement of an inertialess nonlinear quadripole and of a linear quadripole with time-dependent parameters. The decay characteristics of typical colour luminophors (Zn_2SiO_4.Mn for green, ZnS.Ag for blue, $Zn_3(PO_4)_2$.Mn for red) are considered, and the resulting colour mixture is shown to depend on the amplitude of the three Y components. A brief summary is then given of the effects of aperture limitation of the three-colour tube and of bandwidth characteristics of the luminance and the I and Q channels. A.Landman

621.397.7

1907 MASTER CONTROL TECHNIQUES. B.Marsden.

J. Televis. Soc., Vol. 9, No. 3, 85-94 (July-Sept., 1959).

Describes the control of British Independent Television Services where a master control room must have immediate facilities for feeding out from its station selected programmes for transmission by other programme contractors. The technique of switching commercial breaks in programmes rapidly and repeatedly, the desirability of effecting smooth transition from a local to a remote picture and the provision of cueing signals are discussed. The network facilities required, e.g. vision mixers, sound mixers and switching panels, and their usage are described. Other features considered are the cue dot generator, giving a warning signal at the top right-hand corner of the screen, the comparison of crystal and pendulum clocks and the master switcher unit. H.G.M.Spratt

621.397.74

1908 EUROVISION. I. ORGANIZATION AND GROWTH. J.L.Bordewijk.

Electrotechniek, Vol. 37, No. 18, 405-14 (Sept. 3, 1959). In Dutch.

Discusses the part played by the Netherlands P.T.T. in the development of Eurovision. The design of the cable, containing 6 separate coaxial cables, linking Hilversum with the video switching centre at Bussum is described. The layout of the Dutch television relay is shown in a map indicating type of polarization, distances between stations and frequencies. G.N.J.Beck

621.397.74

1909 EUROVISION. II. VIDEO TRANSMISSION. J.L.Bordewijk.

Electrotechniek, Vol. 37, No. 21, 481-90 (Oct. 15, 1959). In Dutch.

For Pt I, see preceding abstr. Suppression of the null component of the video signal; non-linear distortion, both static and dynamic, noise, and interference signals of a periodic nature are discussed. The analysis of a video transmission circuit by means of the measurement signals specified at the Monte Carlo conference of 1958 is explained; these are of three types, a scanning frequency square-wave voltage, a line frequency square-wave voltage and a line-frequency sawtooth voltage with "sine" superposition.

G.N.J.Beck

621.397.74

1910 A TRANSMISSION DESIGN FOR CLOSED CIRCUIT EDUCATIONAL TELEVISION. W L.Wall.

Trans Amer. Inst. Elect. Engrs I, Vol. 78, 340-6 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

In its initial form this installation embraces nine schools within a 15-mile radius fed from a main studio. The system, which is termed a "round robin" (a quasi-ring-main) system, operates with two channels, but a total of five, covering the band 20-100 Mc/s, is anticipated ultimately. Two of these channels will be allocated to certain of the schools for transmission into the system. A 77 Mc/s

pilot signal is combined with the television signal for control purposes. Two types of repeater, a manually controlled and an automatic-level-control amplifier, are provided at 2700-4000 ft intervals along the line. One function of the repeaters is to compensate for day-to-day and seasonal changes. The transmission cable is a gas-pressure coaxial cable with polythene disk spacers. Details of the operating specification, protection, test equipment, maintenance and spares are given. H.G.M.Spratt

CONTROL . DATA PROCESSING

CONTROL AND SERVO SYSTEMS

621-52

1911 ELUCIDATION OF STABILIZATION METHODS WITH THE AID OF FREQUENCY CHARACTERISTICS.
E.Fiebig.
Elektrotech. u. Maschinenbau (E.u.M.), Vol. 76, No. 21, 510-16 (Nov. 1, 1959). In German.

The frequency and phase characteristics of typical control elements are studied in relation to the Nyquist diagram and the overall characteristic required for a cold rolling operation control is established. The way in which the overall characteristic may be influenced by different stabilizing elements is explained.
W.G.Stripp

621-52

1912 ON FINDING A BEST LINEAR APPROXIMATION TO SYSTEM DYNAMICS FROM SHORT DURATION SAMPLES OF OPERATING DATA. R.A.Woodrow.
J. Electronics and Control, Vol. 7, No. 2, 176-92 (Aug., 1959).

A method for the determination of a linear passive system, which most nearly approximates (in the sense that it yields a minimum mean square error) the dynamic behaviour of a given physical system, is described. The method is applicable to situations in which (a) the system investigated has N input variables defining M output variables; (b) data is recorded at each of the input and output terminals during some finite time interval $0 \leq t \leq t$, which represents a short sample of a much longer past history. Unlike methods already developed, the techniques used here do not require any appeal to statistical properties such as stationarity or ergodicity of the data, neither is it necessary to attempt to find a realistic estimate of correlation or spectral density functions. It is suggested that the method described may help to decide whether, in a given trial, the best approximation may be expected to be sensitive to changes in the sample of operating data fitted.

621-52

1913 DETERMINATION OF PERFORMANCE PARAMETERS OF SELF-EXCITED OSCILLATIONS IN CONTROL SYSTEMS. B.A.Rjabow.
Wiss. Z. Tech. Hochsch. Dresden, Vol.8, No.2, 423-9 (1958-59). In German.

Self-excited oscillations in control systems containing so-called "Z" elements, i.e. bistable, non-linear components with symmetrical rectangular hysteresis loops, are treated. Three types of oscillation may occur in these systems: the amplitudes, so called generalized coordinates, increase continuously; the oscillations are attenuated to a level where they do not cause any lockovers in the Z element; the amplitudes attain a steady-state level and frequency. This last case is assumed to be the normal operational regime of the system. It is shown how to develop the set of differential equations describing the behaviour of such a system and the following criteria are deduced from these: the existence conditions of self-excited oscillations; the frequency and amplitudes of the generalized coordinates; stability criteria of the oscillations. A method is given for the selection of system parameters for predetermined self-excited oscillations. The four references (in Russian) discuss a similar problem incorporating Z-elements with non-symmetrical hysteresis loops. E.Erdélyi

621-52

1914 STATIC SEQUENCING AND POSITIONAL CONTROL SYSTEMS. S.A.G.Emms and G.E.Little.
G.E.C. J., Vol. 26, No. 3, 101-4 (Summer, 1959).

Briefly discusses the logical design of these systems, using cold-cathode triodes as elements; examples of schematic layouts are given (but the symbols used are not explicitly defined).
A.O.Stanesby

621-52

1915 POSITIONING ACCURACY TO 0.01 INCH WITH SIMPLIFIED NUMERICAL CONTROL.
Elect. Manufng, Vol.64, No.2, 98-103 (Aug., 1959).

Describes the application of punched-tape control to a multiple-head, inert-atmosphere, arc spot-welding machine. Linear positioning accuracy of 0.01 in. is obtained by a simplified servo system employing coarse and fine resolvers for feedback, tapped transformers for digital–analogue signal conversion from the punched tape, electrodynamic servo valves, hydraulic motors and ball-bearing screws.

621-52 : 621.311.153

1916 THE POSSIBILITIES AND OBSTACLES IN THE AUTOMATIC CONTROL OF THE HEAT BALANCE OF A BOILER PLANT. J.Křečan.
Energetika (Prague), Vol.9, No.11, 552-9 (1959). In Czech.

Automatic dispatching requires the continuous calculation of energy costs and this depends to a large extent upon the heat balance of the boiler plant. Discusses methods and accuracy of the measurement of the parameters which are needed for the calculation of the heat balance. Difficulties are encountered especially with the measurement of quality and heat content of fuel. Types of computers used for rapid calculation of the heat balance are briefly described.
N.Klein

621-52 : 621.311.22

1917 LITTLE BARFORD "B", ELECTRONIC BOILER-CONTROL.
Elect. Rev., Vol. 165, No. 14, 635-42 (Nov. 13, 1959).

Little Barford power stations "A" and "B" are briefly described. The "B" station has two 60 MW turbo-alternators with coal-fed boiler units. Evershed and Vignoles three-term electronic process controllers and the Evershed electric repeater system are used throughout. A description of the controllers and the various process measuring transducers are given, and an overall schematic of the control system is given. The scheme sub-divides into, combustion control depending on steam-pressure and air/steam flow, steam temperature control, and mill inlet control. Thus the control system effectively senses the demand load for steam and regulates the boiler fuel input and combustion rate. To solve certain algebraic relationships required in the system, force-balance electromechanical analogue-computing elements are used. Many detailed quantities are given for items of the plant, and the article is liberally illustrated. K.C.Garner

621-52

1918 UNISELECTORS ENTER AUTOMATIC PROGRAMME CONTROL. I. H.Law.
Control, Vol. 2, No. 15, 96-9 (Sept., 1959).

Methods of controlling rolling mill operation by means of uniselector programming are described. It is shown that the uniselectors may fulfil all the control functions, carrying out programme selection, programme storage, pass selection and output control. Use of a plugboard is suggested for trial and little-used programmes. T.Horrocks

621-52

1919 APPLICATION OF DATA-LOGGING AND PROGRAMMING TECHNIQUES TO STEEL MILL PROCESSES.
R.W.Barnitz and G.E.Terwilliger.
I.R.E. Trans Industr. Electronics, No. PGIE-10 24-32 (July, 1959).

Data-logging and programming are defined and a qualitative account given of the application of programme control to reversing primary mills and to tandem mills. A description of automatic data-logging systems for tinning and annealing lines is also included.
M.Rathbone

621-52

1920 RECENT DEVELOPMENT OF ELECTRONIC DEVICES FOR AUTOMATIC SIZING. P.Buisson.

Automatisme, Vol. 4, No. 5, 178-82 (May); No. 6, 236-41 (June); No. 7-8, 301-4 (July-Aug., 1959). In French.

Automatic sizing (autocalibrage) is defined as the procedure employed in controlling any quantity to a desired value, when the quantity can vary in one direction only. However, in this paper the main application is to automatic machining of which the general principles are closely examined; no details of the electronic circuits are given. Automatic sizing, in which only one work piece is concerned, is distinguished from automatic correction, in which the measurement made on one work piece is used to correct the succeeding piece. Factors affecting the precision of measurement and the types of gauge which should be used in different cases such as cylindrical pieces with and without surface discontinuities, internal diameters and lengths when they are being machined in different ways are discussed. For the case of automatic correction a device which integrates the errors found in successive pieces is briefly described and full servo control of continuous processes is also mentioned. G.A.Montgomerie

621-52

1921 TRANSPORTATION OF EXPRESS MAIL TO THE SORTING POST OFFICE AT BRUSSELS SOUTH STATION. M.Rossion.

A.C.E.C. Rev., 1959, No. 3, 24-33. In French.

The plant described is fully automatic. The mail, carried in a special case which rests on the frame of a small 18 cm gauge, two-bogie motored truck, is conveyed from one end to the other of the underground line, which is 400 m long. At the terminal stations and at the intermediate one the case is automatically lifted from the truck and brought to the level of the offices by lifts. The four d.c. motors (one for each lift and one for the truck) are separately excited and fed, one at a time, from a Ward-Leonard generator. The control circuit which includes a magnetic amplifier ensures the accurate control of speed of the truck and lifts, the correct sequence of operations, and the signalling of position of the mail at any point of its travel. The two rails carrying the truck, insulated from each other, supply current to the traction-motor armature, a third rail feeds the separate excitation winding. A.Karlsbad

621-526

1922 INFLUENCE OF THE POSITION IN THE COMPLEX PLANE OF THE ROOTS OF THE TRANSFER FUNCTION ON THE TRANSIENT RESPONSE OF SERVOMECHANISMS. Z.Dráb.

Slaboproudy Obzor, Vol.20, No.10, 617-22 (1959). In Czech.

Servomechanisms having transfer functions whose denominators are second-, third- and fourth- degree polynomials are considered. The trajectories of the roots in the complex plane are sketched and specific values of the roots on the trajectories are indicated. Transient characteristics, overshoot and rise-time corresponding to specific values of the roots are plotted. It is found that when the position of the roots is varied continuously, the transient parameters (rise-time and overshoot) undergo continuous (sometimes monotonic) changes. R.S.Sidorowicz

621-526

1923 EVALUATION OF TRANSIENT SYSTEM RESPONSE. F.P.De Mello.

Trans Amer. Inst. Elect. Engrs II, Vol. 78, 177-86 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

A method is described of obtaining transient system response from the open-loop frequency response. This is based on determination of the roots of the characteristic equation. It is shown that this can be done by using Bode-type plots for the open-loop response to imaginary or complex frequencies. This is obtained by using standard correction curves to the Bode straight line approximations and also to the phase-angle plots. These correction curves may be made up as templates. The procedure is very simple where the closed-loop and open-loop transfer functions have only real roots but becomes more complicated for complex roots where a different template is required for each value of relative damping. Examples of calculations are given for each case. T.Horrocks

621-526

1924 A NEW CHART RELATING OPEN-LOOP AND CLOSED-LOOP FREQUENCY RESPONSES OF LINEAR CONTROL SYSTEMS. C.F.Chen and D.W.C.Shen.

Trans Amer. Inst. Elect. Engrs II, Vol. 78, 252-5 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

The new chart represents the amplitide and phase of the closed-loop transfer function in terms of the real and imaginary parts of the open-loop transfer function. The construction resembles an extension of the Smith chart of h.f. transmission theory and a number of practical advantages over the well-known Nichols chart are claimed. T.Horrocks

621-526

1925 THE EFFECT OF AN ADDITIONAL NON-LINEARITY ON THE PERFORMANCE OF TORQUE-LIMITED CONTROL SYSTEMS SUBJECTED TO RANDOM INPUTS. J.L.Douce and R.E.King.

Proc. Instn Elect. Engrs, Monogr. 361M, publ. Feb., 1960, 8pp. To be republished in Part C.

Discusses a technique for improving the response of a saturating servomechanism subjected to random signals. It is shown that a non-linear error detector gives a considerable reduction in error magnitude for a large range of input signals. It is possible to design the additional non-linearity to optimize the performance of the system for all input magnitudes. This form of non-linearity has previously been shown to effect improvement in the response of such systems to step-function and sinusoidal inputs. Experimental work verifies the predicted results for a particular system, and shows that considerable latitude is permitted for the characteristic of the additional non-linearity.

621-526

1926 A RELAY-TYPE FEEDBACK CONTROL SYSTEM DESIGN FOR RANDOM INPUTS. A.M.Hopkin and P.K.C.Wang.

Trans Amer. Inst. Elect. Engrs II, Vol. 78, 228-33 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

Among the conditions necessary for operation of a relay-type control system with random inputs, the structure of the input signal and noise should be such that the signal can be predicted into future time in terms of a power series whose coefficients are functions of the present total input and of a finite number of its derivatives. Also, the response should be describable by power series. A decision element can then control the sign of the forcing function to reduce the error and its derivatives to zero in the shortest possible time. A particular system is analysed, and it is shown that the sign of the forcing term should be opposite to that of the error rate. A motor positioning system incorporating a predictor and decision unit was set up on an analogue computer and was compared with a system driven by a high gain amplifier saturating at the forcing function levels, and another including a derivative compensating element. The predictor-controlled system proved far superior to the others. A similar procedure is used to derive the switching criterion for a relay-driven system with two time constants. In an appendix, a phase plane description of the switching criteria is given. W.G.Stripp

621-526

1927 AN EXAMPLE OF A CONTROL CIRCUIT WHICH CONTAINS NON-LINEAR ELEMENTS. R.Schraivogel.

Bull. Assoc. Suisse Elect., Vol. 50, No. 22, 1068-74 (Oct. 24, 1959).

The example is that of a machine for producing extruded aluminium sections. Separate forces are applied to the hot metal fed into the die and to the section as drawn. The latter force must be controlled within certain limits and is produced by an induction motor driving through eddy-current clutch and brake and endless chain. The cut-off frequency of the loop is 2.2 c/s while the natural frequency of the regulator is 0.7 c/s; the stability is conditional and a certain minimum loop gain is required. Three principal non-linearities are present: driving force as a function of the excitation of the clutch and brake; friction; the spring-characteristic of the tensometer which measures withdrawal force. The loop analysis, which is only described qualitatively, uses the describing function and exposes the need for a stabilizing network with a complicated frequency-characteristic including limiting. An example of a suitable network is shown. It is emphasized that the most important role in the design of non-linear servos is played by experiment. S.C.Dunn

621-526

1928 MINIATURE SERVO COMPONENTS. I-II. M.Lowenberg.

Brit. Commun. and Electronics, Vol. 6, No. 8-9, 610-14 (Aug.-Sept.); No. 10, 682-7 (Oct., 1959).

Discusses the use of miniature servo components in automatic control systems, and outlines the performance characteristics of a.c., d.c. control, d.c. shunt and permanent-magnet motors. The second part surveys the principal characteristics of a.c. tachogenerators, synchros, servo amplifiers, relay controls and discusses the requirements for gearing, and overall system design.

621-526

1929 ELECTRIC LINK FOR FLYING CONTROLS. H.H.Dixon.

Control, Vol. 2, No. 15, 87-90 (Sept., 1959).

An experimental electrical signalling system is described which replaces the mechanical linkage between pilot and servo actuator. The original mechanical system is first described, which uses a variable-delivery pump. The electrical link is inserted so that its output controls a torque motor to modulate the hydraulic power to the existing ram in each of the flight control channels. Feedback potentiometers on the control-surface shafts close the position-signal loops. Magnetic amplifiers provide the electrical gain and the summing circuits. Pilot's "feel" is included in the scheme but not described. Safety is provided for by duplicating signal channels, so that the failure of one path still enables a full-scale travel but half-rate control to operate. Other measures are incorporated in the remaining mechanical circuits particularly concerning the dual pilot controls to further the safety of the aircraft. An appended contribution by G.A.Whitfield questions the advisability of simple duplication, and quotes cases where triplication provides the only possibility for reasonable safety with systems where an expected channel life is 10 000 hours. K.C.Garner

621-526

1930 A WIND-TUNNEL SERVO FOR STAGNATION PRESSURE. H.Fuchs and D.Wheable.

Control, Vol. 2, No. 16, 84-7 (Oct., 1959).

The control system for a 27 in. by 27 in. blow-down tunnel utilizes a Statham 0-100 lb/in^2 unbonded strain gauge differential transducer as the sensing element within the settling chamber. Its output is amplified and compared with a reference potential to generate an error signal which, after suitable shaping, controls a Moog valve. The hydraulic output of the Moog valve is controlled within a feedback loop and actuates a Harland valve, which comprises a 24 in. plug rotated by a hydraulic jack carrying a 5¼ in. piston. The Harland valve restricts the upstream end of the tunnel. The linearized theory is given in two appendices. Work is continuing to improve the pressure-holding accuracy from 0.3% to 0.05% of full scale. K.C.Garner

621-526

1931 DIGITAL CONTROL SYSTEMS. H.Rechberger and H.Sequenz.

Elektrotech. u. Maschinenbau (E.u.M.), Vol.76, No.22, 530-5 (Nov. 15, 1959). In German.

A brief discussion of digital control systems; both continuous and on-off servos are considered. A.O.Stanesby

621-526 : 531.75

1932 A PHOTOELECTRIC FOLLOWUP AND RECORDING SYSTEM, AND ITS APPLICATION TO REMOTE OBSERVATIONS OF THE BEAM IN HIGH-PRECISION BALANCES. H.A.Bowman and L.B.Macurdy.

J. Res. Nat. Bur. Stand., Vol. 63C, No. 2, 91-6 (Oct.-Dec., 1959).

A device is described which permits a significant increase in the frequency of the oscillations of the beam of a balance, thereby shortening the interval during which upsetting ambient conditions can act. The device is a servo-driven photoelectric follow-up system responding to the position-modulated light signal reflected from a mirror attached to the balance 12 ft away from the photocell. Reproducibility in observing the position of the light beam is 0.001 in. or less.

621-526

1933 CONTROL BY ELECTROHYDRAULIC SERVO. C.R.Himmler.

Automatisme, Vol. 4, No. 11, 403-12 (Nov., 1959). In French.

Characteristics of hydraulic valves as used in control mechanisms are discussed. The significance of time-lags in valves and in hydraulic motors or actuators controlled by valves is pointed out. Application of a two-stage valve is considered. Arrangements of control mechanisms with mechanical as well as electrical feedback are shown. Application of such systems to the control of supersonic aircrait, power presses and to road levelling is mentioned. T.Horrocks

621-526

1934 A DOUBLE-INTEGRATION HYDRAULIC SERVO. D.J.Mager and O.A.Walker.

Elect. Manufng, Vol. 64, No. 4, 130-3 (Oct., 1959).

Description and theory of operation of the electrohydraulic servo system which controls the tail turret on a bomber aircraft. Double integration provides for errorless tracking of a target (following a constant-velocity signal) and fast system response insures rapid acquisition of a new target.

TELECONTROL . TELEMETERING

621.398

1935 INFRARED DETECTOR TRAINS TANK GUNNERS FOR COMBAT. W.P.Battista, I.Roth and R.Rachlis.

Electronics, Vol. 32, No. 45, 60-3 (Nov. 6, 1959).

The equipment comprises a radio-controlled vehicle carrying a trapezoidal target in which are placed three telescopes and a lead sulphide cell to detect the passage of bullets through a region of the target corresponding to vulnerable parts of a tank. A mobile console steers the vehicle with the aid of forward and reaward views transmitted by two television cameras in the vehicle. Hits are also indicated by smoke generated by automatic release of liquid titanium tetrachloride in a spray. The range of vehicle control is 2000 yards. W.G.Stripp

621.398

1936 RADIO TELEMETERING FROM WITHIN THE HUMAN BODY. R.S.Mackay.

I.R.E. Trans Med. Electronics, Vol. ME-6, No. 2, 100-5 (June, 1959).

In recent years small radio transmitters have been developed that can transmit physiological information from within the human body. The present units are small enough to be introduced into the bladder, or to be swallowed without unpleasant sensation. A summary of these recent developments is given along with some of the present lines of investigation toward future forms. A representative unit is described in some detail.

621.398

1937 ELECTRICAL FEATURES OF THE FOUR CORNERS PIPE LINE. J.J.Sonnier and H.N.Siler.

Trans Amer. Inst. Elect. Engrs II, Vol. 78, 209-23 (1959) - Applic. and Industr., No. 44 (Sept., 1959).

The pipe line is designed for completely unattended operation. The main-line pump stations, pressure-reducing stations, delivery valve stations, booster pumps, tank-filling and suction valves are designed for remote operation. Most of the feeder stations are equipped for automatic custody transfer operation. The design of the communications and control systems provides for safe and reliable operation of the pipe line and provides the control point with all the necessary telemetered quantities, pressures, flows, gravity and set points, for the remote operation of the facilities. All necessary local protective devices are provided to permit safe operation during communications or supervisory control equipment failures. The electric power distribution, control and communication schemes employed in the above scheme are discussed. Also included in the text are circuit diagrams and photographs of the equipment used. G.V.Hargreaves

COMPUTERS . APPLICATIONS

(Refer also to Digital circuits . Switching circuits)

681.142

1938 THE BULL GAMMA 3 ELECTRONIC COMPUTER. H.P.Tomson.

Electrotechniek, Vol. 37, No. 24, 553-9 (Nov. 6, 1959). In Dutch.

The Gamma 3 electronic computer is used as an independent computing unit in the Bull punched card system. Standard punched card machines are used as input and output devices. The punched cards are read by a Bull tabulating machine or reproducing punched card machine which transmits the collected data to the computer via a multicored cable. The counter input of the counter, the memory line and impulse regenerator are described. G.N.J.Beck

681.142

1939 A GENERAL PURPOSE COMPUTING-LOGGER. K.G.Harple and J.Baconnet.

A.I.E.E. Analog and Digital Instrumentation Conference Paper, p. 113-22. See Abstr. 3875 (1959).

160 points are scanned, measured, and digitized at the rate of one per second by mercury-wetted contact relays and a code-wheel shaft-position indicator on a self-balancing measuring instrument. The outputs are scaled, linearized, and averaged by a Royal Precision LGP-30 computer, which also performs alarm detection and computes 27 secondary variables which are useful as operating guides to the catalytic cracker used for the trial installation. Hourly or on-demand print-out is on a Flexowriter and there is also a Clary 1903 Serial Printer for off-normal points and (on-demand) the 27 auxiliary variables. Reliability is also discussed.

G.A.Montgomerie

681.142

1940 A NEW STORED PROGRAM INFORMATION SYSTEM. G.S.Daniels.

A.I.E.E. Analog and Digital Instrumentation Conference Paper, p. 123-9. See Abstr. 3875 (1959).

For use as an on-line data reduction machine, a conventional stored-programme computer is provided with an almost unlimited number of switched inputs either by crossbar switches or mercury-wetted contact relays. The facilities available for on-line process data reduction and control are then dependent more on the programmer's skill than the equipment available. G.A.Montgomerie

681.142 : 621.311.1

1941 ITERATION METHODS FOR DIGITAL LOAD FLOW STUDIES. J.E. Van Ness.

Trans Amer. Inst. Elect. Engrs III, Vol. 78, 583-8 (1959) = Pwr Apparatus Syst., No. 43 (Aug., 1959).

In the method of Ward and Hale (Abstr. 1214 of 1957) for studying the flow of power in an electricity supply network it is necessary to find the solution of a set of nonlinear equations by an iteration process. A number of methods of improving the speed of solution is examined and it is demonstrated that the simultaneous determination of corrections for all node pairs can result in a substantial reduction in the number of iterations required for convergence. A penalty is incurred in the increased time required for each iteration. In the sample 6-node problem for which the calculations were carried out on an IBM 650 using SOAP the number of iterations was reduced from 53 to 21 but the time increased from 9 secs to 23 secs per iteration. For larger systems there might be an overall saving of time. G.A.Montgomerie

681.142 : 621.316.1

PROGRAMMING DIGITAL COMPUTERS FOR CALCULATION OF ECONOMICAL LOAD DISTRIBUTION IN POWER SYSTEMS. See Abstr. 1257

681.142 : 621.316.11

DETERMINATION OF DISTRIBUTION TRANSFORMER LOADING FROM KILOWATT-HOUR CONSUMPTION BY ELECTRONIC COMPUTATION. See Abstr. 1261

681.142 : 621.316.1

A COMPUTER FOR ECONOMIC LOAD DISTRIBUTION. See Abstr. 1262

681.142

1942 THE DESIGN OF AN INDUSTRIAL DIGITAL DATA HANDLING SYSTEM. J.V.Werme.

A.I.E.E. Analog and Digital Instrumentation Conference Paper p. 130-40. See Abstr. 3875 (1959).

A description, primarily from the mechanical and servicing point of view of a modular system of building digital control systems. Modules may be electronic or electromechanical and are of several sizes, fitting eventually into a standard relay rack. No multiconductor cables are used, interconnecting wiring and components are separated, components are plug-in where possible and all are designed for industrial service. G.A.Montgomerie

681.142

1943 THE USE OF COMPUTERS FOR OPTIMAL PLANNING. C.M.Berners-Lee.

Brit. Commun. and Electronics, Vol. 6, No. 11, 776-80 (Nov., 1959).

681.142

1944 LIGHT-PEN LINKS COMPUTER TO OPERATOR. B.M.Gurley and C.E.Woodward.

Electronics, Vol. 32, No. 47, 85-7 (Nov. 20, 1959).

Describes an ingenious additional form of two-way communication between operator and computer. The device is used in conjunction with the usual c.r.t. display. A small pen-like light sensing probe (light-pen) is held by the operator close to a particular dot in the display. The probe, which is coupled to the computer by means of circuits which are described, is thus enabled to modify the corresponding digit in the computer store in any predetermined manner. Various applications of the idea to the control of the computer are illustrated. A.E.I. Research Laboratory

681.142 : 621.318.12 : 538

RECENT ADVANCES IN MAGNETIC DEVICES FOR COMPUTERS. See Abstr. 1427

681.142 : 621.318.1 : 538

REVERSIBLE, DIODELESS, TWISTOR SHIFT REGISTER. See Abstr. 1426

681.142 : 621.317.79

1945 A PRECISION RECORDER FOR DATA PROCESSING SYSTEMS. D.Broder.

Instrum. Pract., Vol. 13, No. 11, 1127-31 (Nov., 1959).

The evolution of a precision instrument for measuring the output from d.c. strain-gauge bridges and other forms of transducer is described. It incorporates a number of unique features and uses a commercial chart recorder as its basis.

681.142 : 621.317.75

1946 A NEW CONCEPT OF ANALOG RECORDING. D.D.Trautner.

A.I.E.E. Analog and Digital Instrumentation Conference Paper, p. 37-42. See Abstr. 3875 (1959).

A description of the Honeywell Model 1012 Visicorder which makes use of ultraviolet sensitive photographic paper to make the oscillographic traces immediately visible. The trace is also "intensified" by exposure to light from a source of low intensity. Provision is also made for time marking and for a reversed drive so that traces can be re-examined. G.A.Montgomerie

681.142

1947 FUNCTION GENERATION WITH OPERATIONAL AMPLIFIERS. H.Koerner and G.A.Korn.

Electronics, Vol. 32, No. 45, 66-70 (Nov. 6, 1959).

Discusses several discontinuous function circuits based upon the technique utilizing the amplifier voltage gain to increase the accuracy and sharpness of diode cut-off. Circuits are developed from the basic configuration for comparators, multivibrators, integrator reset circuits, etc. K.C.Garner

681.142

1948 USE YOUR ANALOGUE COMPUTER AS A TRANSFER FUNCTION ANALYSER. K.C.Garner.

Brit. Commun. and Electronics, Vol. 6, No. 11, 764-6 (Nov., 1959).

Simple computer circuits are discussed which generate the test frequency and provide gain and phase comparator circuits in conjunction with a c.r.o. Phase comparison is by means of a Lissajou display which indicates a null when the phase-shifting circuit, having a transfer function $(1 - sT)/(1 + sT) = V_o/V_i$, is adjusted to match exactly the phase shift in the measured system response. Simulation set-ups can be measured in this way by utilizing part of the same computer as the measuring equipment. K.C.Garner

681.142 : 537.3

1949 USE OF A DIODE RING AS A FOUR-QUADRANT MULTIPLIER. R.H.Wilcox.

Rev. sci. Instrum., Vol. 30, No. 11, 1009-11 (Nov., 1959).

At low-voltage levels a diode ring forms an extremely simple four-quadrant passive analogue multiplier characterized by reliability, stability, and wide bandwidth. Operation is analysed theoretically, and experimental tests are described. These show that with care in selecting diodes and adjusting circuit values, 1% accuracy is obtainable at input levels up to 150 mV.

681.142 : 518.5 : 538.56

1950 ANALOG INTEGRATOR FOR E.P.R. SPECTRA. R.P.Schwenker.

Rev. sci. Instrum. Vol. 30, No. 11, 1012-13 (Nov., 1959).

An electromechanical analogue integrator for obtaining a continuous time integral of varying voltage is described. It is suited for applications where integrating times of greater than one minute are encountered. Particular consideration is given to its applicability to magnetic resonance data reduction.

681.142

1951 PREDICTING THE PERFORMANCE OF A WIND TUNNEL REGULATING SYSTEM USING AN ANALOG COMPUTER. R.Herbst, J.O.Nichols, F.W.Keay and R.W.Miller.
Trans Amer. Inst. Elect. Engrs II, Vol. 78, 248-52 (1959) = Applic. and Industr., No. 44 (Sept., 1959).

The simulation of the regulation of a single-wound rotor induction motor which drives the compressor stages is described. A tachogenerator signal is compared with a reference to provide the error signal which is diode-limited between controlled values. This signal is power-amplified and used to control a shunt-tuned Rototrol, which in turn energizes a motor to vary liquid rheostats in series with the induction-motor secondary resistance. This provides a torque and hence a speed control for the drive. The block diagram is given with appropriate transfer functions. The simulator configuration is shown without set-up values, and recordings of starting conditions are illustrated. Appendices develop the associated theory. K.C.Garner

681.142

1952 ELECTRONIC "ROTOR". ANALOGUE COMPUTING ELEMENT. J.S.Johnston.
Electronic Technol., Vol. 37, No. 1, 2-6 (Jan., 1960).

Discusses a novel method which has been developed for introducing the concepts of bearing and angle into fast cartesian analogue computations, without the use of mechanical shafts and servomechanisms.

681.142 : 621.335

1953 THE TRAIN PERFORMANCE PLOTTER [DER FAHRDIAGRAPH]. F.Hünni.
Bull. Assoc. Suisse Elect., Vol. 50, No. 24, 1176-81 (Nov. 21, 1959). In German.

Describes an analogue computer specially designed to calculate and plot the motion of railway trains. Equations computed are nonlinear functions of the mass of the train, tractive effort, braking effort, resistance to motion, acceleration, velocity, and distance. The traction-motor temperature is also determined. The relationships between these quantities are discussed. Braking force for example, consists of the regenerative term related to velocity, combined with manually-applied friction-brakes, which leads to nonlinearities and discontinuities in the simulation. The computing techniques are fairly conventional, using electromechanical servo-integrators, and the computing variable-capacitor utilizing a.c. signals, popular in Swiss computers. Photographs of the prototype equipment are shown. K.C.Garner

681.142

1954 THE REPRESENTATION OF A TRANSMISSION LINE, WITH VARIOUS BOUNDARY CONDITIONS, BY MEANS OF AN ANALOGUE COMPUTER. J.Matyaš.
Arch. elekt. Übertragung, Vol. 13, No. 11, 482-6 (Nov., 1959). In German.

A loss-free delay line, with complete reflection at one end, is used as an example to show how the computer can be programmed to solve the second-order differential equations involved in transmission-line problems. V.G.Welsby

681.142

1955 A CODE TRANSLATOR FOR LETTER-SORTING MACHINES. J.D.Andrews.
Post Off. elect. Engrs' J., Vol. 52, No. 3, 199-205 (Oct., 1959).

In sorting mail using a letter-sorting machine, the operator must memorize up to 144 combinations of a 2-letter code required in the operation of the machine. A code translator is described which translates a 5-letter code, easily derived from the address, into the required 2-letter code.

681.142

1956 EQUIPMENT FOR TRAINING LETTER-SORTING-MACHINE OPERATORS. G.A.Wylie.
Post Off. elect. Engrs' J., Vol. 52, Pt 1, 55-60 (April, 1959).

Single-operator letter-sorting machines are being installed at a number of offices. Methods of training the machine operators are given with details of the equipments developed for use as training aids.

MECHANICAL AND CIVIL ENGINEERING TECHNOLOGY

MATERIALS . TESTING

620.11

1957 QUALITY ASSURANCE PROGRAM. R.A.Hulnick, H.G.Harding and J.T.Rowinski.
Trans Amer. Inst. Elect. Engrs I, Vol. 78, 326-35 (1959) = Commun. and Electronics, No. 44 (Sept., 1959).

An outline of the quality assurance procedure used in a computer factory. The intent of the report is to present a programme which will: (1) develop a system for examining and rating each electromechanical component-manufacturing area and each product of these areas prior to sending the component to stock; and (2) to determine the inspection efficiency for each inspection. The topics discussed include master control of manufacturing areas and audit control of material in stock. Interrelation of these two (including the inspection efficiency nomograph) is described separately. Derivatives of all formulae are given in appendices and the operational procedure is listed. H.A.Miller

620.172.22

1958 ELECTRONIC STRAIN MEASUREMENT. MODERN ANSWERS TO AN OLD PROBLEM. G.Hitchcox and L.W.Harrison.
Brit. Commun. and Electronics, Vol. 6, No. 12, 840-4 (Dec., 1959).

Reviews the general problem, and describes recent progress, especially in instruments using resistance and acoustic gauges.

620.172.222

1959 HIGH TEMPERATURE STRAIN GAUGES. K.Haines.
Hawker Siddeley tech. J., Vol. 1, No. 3, 4-8 (Autumn-Winter, 1959).

A technique has been developed for using resistance strain gauges to measure turbine blade stresses at temperatures up to 750°C. The gauges consist of 0.0006 in. diameter 80–20 Ni–Cr alloy formed into the customary grid by a jig and attached by Durofix to a backing of blotting paper. The gauges are attached to the turbine blade by a cement known as Brimor U.529, which consists of a mixture of basic oxides and phosphoric acid. The curing cycle starts with an air-drying period of ½ hr., followed by ½ hr. heating to 80°C under infrared lamps. The component is then baked in an oven for an hour each at 100, 250 and 350°C. The turbine blade is cleaned and lightly coated with the cement before the gauge is attached. After this coating has cured, the gauge is clamped against it and the ends of the grid are lightly attached by cement. The blotting paper backing is then removed by soaking with acetone to remove the Durofix, and then the whole gauge is covered by cement and cured. The signals are picked off by the usual slip-ring arrangements and are either inspected visually on an oscilloscope or recorded. A.C.Whiffin

620.179.15 : 621.389

1960 MICRO-RADIOGRAPHIC STUDIES USING LOW KILOVOLTAGES. N.C.Cordingly.
Metropolitan-Vickers Gaz., Vol. 30, 216-25 (Sept., 1959).

Examples of contact microradiography using a Raymax 50 unit with various fine-grain films are given. The materials include biological specimens (a dragon-fly eye and weevil-infested maize) and specimens of paper and bone. The technique has wide applications for low density materials including aluminium alloy and plastics. F.T.Farmer

620.193.91

1961 STANDARDIZATION OF CLIMATIC AND MECHANICAL LIFE TESTS. Z.Tuček.
Slaboproudy Obzor, Vol. 20, No. 8, 482-6 (1959). In Czech.

Standardization of climatic and mechanical life tests aims at:

(1) preparation of test methods and specifications for test equipment; (2) determination of relationships between test conditions and actual tropical environments; and finally (3) preparation of a comprehensive manual containing data relating to materials, technological processes, components and protective coatings to be used in tropicalized equipment. The Czechoslovak standard CSN 34 5681 is reviewed on the basis of the above requirements and present inadequacies are pointed out. The standard is now being revised; the humid heat tests are to be changed, the salt spray test is to be modified by employing an aerosol generator and additional tests are being introduced. R.S.Sidorowicz

620.197.3

1962 PROTECTION OF METALS AGAINST THE ATMOSPHERIC CORROSION IN THE TROPICS. K.Bartoň.
Slaboproudy Obzor, Vol. 20, No. 8, 509-14 (1959). In Czech.

On the basis of their corrosive aggressivity, atmospheric conditions are classified as: dry enclosed (air-conditioned) localities; enclosed localities where vapour condensation takes place; humid moderate, subtropical and tropical regions without chemical impurities; industrial regions in humid moderate, subtropical and tropical areas. The anti-corrosion characteristics of a number of materials are shown and compared in four tables. Small components (springs, screws, etc.) require special protection in the form of cadmium or chromium plating. Corrosion can be combated by technological means; various sensitive components can be hermetically sealed, fissures and surface cracks should be avoided and certain types of bimetallic contact must not be used. A great deal of protection can be achieved by coating metal surfaces with suitable organic varnishes. R.S.Sidorowicz

669.2

1963 SINTERED CONTACT MATERIALS. G.Blum.
Elektrie, Vol. 13, No. 6, 201-6 (June, 1959). In German.

A detailed study of the properties of various sintered contact materials, for the purpose of finding a material which will combine as far as possible all the desirable quantities, such as high thermal and electrical conductivity, hardness, and freedom from oxidation and inter-electrode transfer. P.M.Davidson

WELDING . SOLDERING

621.791 : 621.317.39

1964 A RECOMMENDED PROGRAM FOR RESISTANCE-WELDING INSTRUMENTATION. A.Dixon.
Trans Amer. Inst. Elect. Engrs II, Vol. 78, 199-209 (1959) = Applic. and Indust., No. 44, (Sept., 1959).

The basic variables in resistance welding in descending order of variability are : weld current; weld force; weld time. In the measuring equipment described, the welding transformer primary current is measured with a 3-range (tapped secondary) current transformer and an ammeter provided with an adjustable lower pointer stop. The c.t. ratios are 200, 400 and 600/5 A, alternatively, 300, 600 and 1200/5 A. The pressure gauge and pneumatic pressure regulator normally fitted to most welders are used for measuring weld force. Where dual force systems are used, a strain gauge, amplifier and oscillograph are necessary. Weld-timer calibration is checked by a cycle-counting-instrument. Tables are given of schedules for spot welding various thicknesses of mild steel and aluminium alloys. C.F.Pizzey

621.791 : 620.179.16

1965 ULTRASONIC WELD TESTING MADE EASIER. R.Hornung.
Engineering (London), Vol.188, 141-2 (Sept. 4, 1959).

The use of scales superimposed on an oscilloscope display to facilitate indentification of flaw echoes in described. Both direct and indirect reflections can be distinguished and after calibration the positions of the flaw can be read off. When examining a steel plate the probe can be at some distance from the weld, overcoming the difficulty of using the rough surface in the immediate vicinity of the weld. Provided the plate is free from laminations, reproducible and sensitive detection of flaws can be performed on any plate more than 8 mm thick. A.P.C.Thiele

621.791.335

1966 SOFT SOLDER CONDUCTIVITY. A.B.Kaufman.
Electronics, Vol. 32, No. 43, 119 (Oct. 23, 1959).

In selecting a solder to meet design and production requirements the melting temperature, solderability, strength and environmental suitability are usually considered, but in some cases the electrical conductivity is of importance. There is a table giving the relative conductivity, tensile strength and plastic and liquid temperatures of tin-lead, indium and bismuth based solders. A short bibliography is included. T.J.Anderson

621.791.7

1967 WELDING FINE THERMOCOUPLE WIRES TO LARGE METAL BODIES. C.D.Colclough and J.Smillie.
Engineer, Vol. 208, 696-8 (Nov. 27, 1959).

A portable welding unit is described which was specially designed to attach fine wire thermocouples with diameters ranging from 0.002 in. to 0.048 in. to large metal bodies. The essential advantage of the unit is that the wires can be accurately positioned by hand and this enables either single or double wire thermocouples to be welded to a wide range of components without recourse to complicated jigs or chucks. A gas-discharge valve is used to initiate the weld, the energy for which is supplied by a bank of electrolytic capacitors.

621.791.7

1968 SYNCHRONOUS RESISTANCE WELDER CONTROLLER FOR ONE TO SEVEN CYCLES.
Mullard tech. Commun., Vol. 4, 289-98 (Aug., 1959).

Describes a completely synchronous timer which may be used to control the duration of a spot weld between one and seven cycles. The design includes complete heat control.

621.791.753.9 : 537.52

1969 THE APPLICATION OF THE THERMODYNAMICS OF IRREVERSIBLE PROCESSES TO WELDING ARCS. E.F.Hollander.
Czech. J. Phys., Vol. 9, No. 2, 229-36 (1959).

The self-regulation of an inert-gas-shielded metal welding arc is dealt with briefly. A thermodynamic equation is derived for the self-regulation of such an arc.

621.791.9

1970 ELECTRON BEAM WELDING. N.F.Eaton.
Nuclear Engng, Vol. 5, 19-22 (Jan., 1960).

A discussion of the advantages of electrom beam welding over conventional argon arc welding methods is made from the viewpoint of control of impurities and welding variables. The principles involved in the application of electron optics to welding are discussed.

LIST OF JOURNALS

The following list supplements the List of Journals published with the Index to Volume 62 (1959). Reprints of the List of Journals can be obtained from The Institution of Electrical Engineers, Savoy Place, London, W.C.2, price 2s.0d. post free.
The addresses given are believed to be correct at the date of publication, but no responsibility can be accepted for errors.

J. Soc. Glass Technol.	Journal of the Society of Glass Technology. Now published in two Sections: Glass Technology (Section A) and Physics and Chemistry of Glasses (Section B).
Ricerche spettrosc.	Ricerche Spettroscopische. Specola Vaticana, Vatican City.

NEW JOURNAL

Phys. Chem. Glasses	Physics and Chemistry of Glasses Society of Glass Technology, Thornton, Hallam Gate Road, Sheffield 10. Bi-monthly. Vol. 1, No. 1 dated Feb., 1960.

ERRATA

Abstr. 678 (1960) line 7: after "extend" insert "their life and make".

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